CLASSIFICATION AND PHYLOGENY OF THE NEW WORLD STICHOLOTIDINAE (COCCINELLIDAE)

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Abstract

The subfamily Sticholotidinae of the Western Hemisphere is taxonomically treated. The tribes Sukunahikonini, Microweisini, Serangiini, and Sticholotidini are recognized; 5 new genera (*Microcapillata, Sarapidus, Nesina, Neotina, Glomerella*) are described; 16 new species in various genera are described. The tribe Sukunahikonini is recorded for the first time from the New World. The phylogenies of the subfamily and each tribe are discussed, and a discussion of zoogeography of the subfamily is included.

The atypical characteristics of certain genera of Coccinellidae, currently placed in the subfamily Sticholotidinae, were first noted by Weise (1887). Weise tentatively proposed the family-group name Pseudococcinellidae for 3 of these Old World genera, *Coelopterus* Mulsant, *Pharus* Mulsant, and *Sticholotis* Crotch. Sicard (1909) perpetuated the use of this name and added the genera *Serangium* Blackburn and *Habrolotis* Weise. Unfortunately, the family-group name Pseudococcinellidae is not available because there is no genus *Pseudococcinella* on which it can be based. Casey (1899) erected the tribe Pharini to include *Pharus* and *Pharopsis* Casey. This tribal name was used by Korschefsky (1931) and remained the name in common usage until 1967. Pope (1962) reviewed the genera of Pharini on a world basis and included the first key to genera. Weise (1901) proposed the tribe Sticholotini. Sasaji (1967, 1968) proposed the subfamily Sticholotinae and indicated that the Sticholotini corresponded to the Pharini as used by Pope (1962). Sasaji pointed out that the generic name *Pharus* Mulsant was preoccupied by *Pharus* Gray (1840) and had been replaced by *Pharoscymnus* Bedel, thus making the name Pharini unavailable. The tribal name Microweisini was proposed by Leng (1920) for the New World genus *Microweisea*. The tribal name Serangiini first appeared in Blackwelder's checklist (1945) and has been accepted by all subsequent authors.

This paper is an attempt to classify the New World genera and tribes of the Sticholotidinae. In previous papers (Gordon 1969, 1970a, 1970b, 1970c, 1970d) individual genera and species have been treated but no complete classification has been proposed.

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Sticholotidinae, **emendation**

Sticholotinae: Weise 1901:430.—Sasaji 1967:2.—Sasaji 1968:19.

Small to medium-sized Coccinellidae; hemispherical or elliptical; functional wings present or absent; dorsally pubescent or not. Head with apical segment of maxillary palpus more or less tapered, conical, barrel shaped or elongate oval; mentum and submentum narrowly joined; antenna with 7 to 11 segments, club composed of 1 to 5 segments. Pronotum sometimes with line or ridge separating anterior angle from disc. Metendosternum with very broadly separated anterior tendon. Abdomen with 5 or 6 visible sterna; male 9th sternum flat. Tarsus 3-segmented or cryptotetramerous. Female genital plate elongate, triangular.

The subfamily is principally characterized by the form of the terminal segment of the maxillary palpus which is not securiform or distinctly broadened apically as is typical of the rest of the Coccinellidae. The form of the maxillary palpus is an excellent distinguishing character for members of the Serangiini, Sukunahikonini, and Microweisini, but some genera in the Sticholotidini have that segment more or less enlarged, approaching the typical coccinellid type.

Members of this subfamily are found throughout the tropical regions of the world with some genera and species occurring also in temperate regions. None of the genera included in the subfamily (except *Sticholotis*) contain very many species, and many are monobasic.

Sasaji (1968) discussed the relationships of the Sticholotidinae quite thoroughly and I agree with his conclusions in most respects. He did not have examples of such genera as *Microweisea* or *Scotoscymnus* to examine, but in spite of this, his classification is basically sound because these and other genera fit that classification with very little adjustment.

The phyletic lineages have not previously been accurately delimited. I have accepted the Sukunahikonini and Serangiini as monophyletic and also consider a third tribe, Microweisini, as a monophyletic element. The fourth tribe, Sticholotidini, remains in a chaotic state and will ultimately have to be split into additional tribes. I have not attempted this here because nearly all of the genera are Old World, and all must be studied in detail.

The following changes in, and additions to, the New World fauna are proposed herein: the tribe Sukunahikonini is recorded from the New World for the first time, and 9 new species are described; the tribe Microweisini is revived and 7 genera in addition to *Microweisea* placed in it, and 2 new genera and 2 new species are described; and 3 new genera and 5 new species are described in the tribe Sticholotidini.

New World Taxa of Sticholotidinae

Tribe Sukunahikonini

Genus *Scotoscymnus* Weise
S. pygmaeus, n. sp.
S. elongatus, n. sp.
S. apterus, n. sp.
S. facetus, n. sp.
S. globosus, n. sp.
S. orchidion, n. sp.
S. stephensi, n. sp.
S. perpusillus, n. sp.
S. colombianus, n. sp.

Tribe Microweisini

Genus *Microcapillata,* n. gen.
M. clypealis, n. sp.
Genus *Sarapidus,* n. gen.
S. australis, n. sp.
Genus *Stictospilus* Brèthes
S. darwini Brèthes
Genus *Microweisea* Cockerell
M. suturalis (Schwarz)
M. minuta (Casey)
M. misella (LeConte)
M. coccidivora (Ashmead)
M. ovalis (LeConte)
Genus *Coccidophilus* Brèthes
C. citricola Brèthes
C. atronitens (Casey)
C. marginata (LeConte)
C. peninsularis (Gordon)
Genus *Pseudosmilia* Brèthes
P. arrowi Brèthes
Genus *Gnathoweisea* Gordon
G. schwarzi Gordon
G. planiceps (Casey)
Genus *Nipus* Casey
N. biplagiatus Casey
N. niger Casey
N. planatus Gordon
N. occiduus Gordon

Tribe Serangiini

Genus *Catana* Chapin
C. clauseni Chapin
Genus *Delphastus* Casey
D. nebulosus Chapin
D. pallidus (LeConte)
D. collaris Chapin
D. minutus Gordon
D. abditus Gordon
D. dubitalis Gordon
D. anthracinus Gordon
D. chapini Gordon
D. catalinae (Horn)
D. diversipes (Champion)
D. pusillus (LeConte)
D. argentinicus Nunenmacher

Tribe Sticholotidini

Genus *Nexophallus* Gordon
N. rufoglobus Gordon
N. semiglobus Gordon
N. lindemanni, n. sp.
Genus *Nesina*, n. gen.
N. amazonia, n. sp.
Genus *Neotina,* n. gen.
N. cariba, n. sp.
Genus *Glomerella*, n. gen.
G. perconvexa, n. sp.
G. gnoma, n. sp.

Key to Tribes of New World Sticholotidinae

1. Antennal club of a single knife-shaped or elongate-oval segment (fig. 78); femora broad, flat, fitting into depressions on ventral surface; prosternum greatly expanded in front to conceal mouthparts (fig. 77) ..... Serangiini
1′. Antennal club composed of more than a single segment or if so, then segment not knife shaped; femora not broad, flat, ventral surface with or without depressions for legs; prosternum not greatly expanded, not concealing mouthparts 2

2(1′). Pronotum with oblique line separating the anterior angle from disc (fig. 61); abdomen with 6 visible sterna 3
2′. Pronotum without oblique line; abdomen with 5 visible sterna ..... Sticholotidini

3(2). Dorsal surface with dense pubescence composed of intermixed long and short hairs (fig. 4); prosternal process extremely slender (fig. 10), prosternum not lobed anteriorly ..... Sukunahikonini
3′. Dorsal surface usually glabrous, if pubescent, then pubescence of uniform length; prosternal process broad, T-shaped (fig. 62), prosternum lobed anteriorly ..... Microweisini

Tribe Sukunahikonini

Sukunahikonini: Kamiya 1960:24.—Sasaji 1967:4.—Sasaji 1968:20.

Small Sticholotidinae with dense dorsal pubescence, pubescence usually composed of intermixed long, mostly erect hairs and shorter, semi-erect hairs. Head capsule with prolonged frons, and clypeus emarginate around antennal insertion; eye small, coarsely faceted; mandible without apical or basal teeth; apical segment of maxillary palpus slender, tapered to apex; antenna either 9-segmented or 10-segmented, club with 1 or 2 segments (figs. 7, 8). Front coxae narrowly separated by slender intercoxal process; prosternum not lobed anteriorly (fig. 10). Leg simple, tibia unmodified. Functional wings present or absent. Abdomen with 6 visible sterna.

The prosternal structure of members of this tribe is, as pointed out by Kamiya (1960), unique within the family. The obvious dorsal pubescence, absence of functional wings (in some instances), and cryptotetramerous tarsi are other characteristics separating this tribe from the Microweisini to which it is most closely related. Two genera of Microweisini possess cryptotetramerous tarsi, but the other genera all have the trimerous condition.

The tribe Sukunahikonini was erected by Kamiya (1960) for a single genus from Japan and Formosa. He later placed a second Formosan genus in it. Chapin (1965) described 8 species from Micronesia in *Pharellus* Sicard without commenting on the affinities of that genus. Pope (1962) included all of the genera here considered to belong in the Sukunahikonini in his review of the Pharini. Because representatives of these genera are rarely collected, type material is often needed in order to examine a genus or species. Thus, genera have been described by several authors, or at least utilized by them, without their being aware that related or synonymous genera were in existence. In the course of determining the affinities of the group of species here treated as members of the genus *Scotoscymnus* Weise, I have examined representatives of all the Old World genera known to resemble that genus. As a

result, I transfer the following genera from Sticholotidini to Sukunahikonini: *Orculus* Sicard (West Africa), and *Scotoscymnus* Weise (equals *Pharellus* Sicard) (pantropical). With the Japanese and Formosan genera *Sukunahikona* and *Hikonasukuna*, there are presently 4 genera in the Sukunahikonini.

The species of *Scotoscymnus* described herein represent the first records of this tribe from the New World. Accurate host records are not available for these species, the available data consisting of such items as "banana scale", "on coconut", or "on orchids". Chapin (1965) lists "*Aspidiotus* sp., on coconut" and "on coconut infested with Furcaspis sp." from Micronesia. Specimens in the USNM collection from Mauritius are labeled "Predator of *Aulacaspis (Pseudaulacaspis) pentagona*" and "on *Furcaspis charmoyi* Brain". Kamiya (1966) has recorded *Sukunahikona japonica* Kamiya as preying on *Aulacaspis difficilis* (Cockerell) in Japan and *Sukunahikona bicolor* Kamiya preying on "Disapididae sp. on citrus", also in Japan. It would seem that the scale genera *Furcaspis* and *Aspidiotus* are preferred hosts for *Scotoscymnus* spp. Both of these genera could occur on orchids, and *Aspidiotus destructor* Signoret is a pest on coconut, and banana. Thus, host preferences of members of this genus obviously are with the family Diaspididae (Armored Scales). According to Beardley and Gonzalez, 1975, armored scales occur anywhere vascular plants are found, but the greatest numbers and diversity of genera and species are tropical. Further information on the zoogeography of diaspidid scales has not been published, but would not be extremely useful anyway because definitive host data are not available for most species of *Scotoscymnus*.

Genus *Scotoscymnus* Weise

Scotoscymnus Weise 1901:458.—Pope 1962:628. Type-species; *Scymnomorphus rotundatus* Weise, by subsequent designation of Pope 1962 (replacement name).

Scymnomorphus Weise 1897:303 (not Blackburn 1892).—Weise 1901:458.

Pharellus Sicard 1928:300.—Chapin 1965:228.—Gordon 1970e:217. Type-species; *Pharellus minutissimus* Sicard, by monotypy. **New synonymy**.

Sukunahikonini with form oval, slightly elongate; dorsum pubescent (fig. 1). Antenna 9 or 10-segmented, club with 1 or 2 segments (figs. 7, 8); apical segment of maxillary palpus elongate, conical (fig. 9). Elytron with lateral margin slightly flared or with distinct, flat ridge (figs. 12, 13). Functional wings and humeral callus present or absent. Abdomen with postcoxal lines divided and pits present or absent (figs. 16, 22); suture between first and second sterna incomplete, sterna fused (fig. 20). Tarsi cryptotetramerous (fig. 14). Male genitalia asymmetrical, parameres greatly reduced or absent (fig. 31).

I have examined specimens of *Scotoscymnus* from Mauritius, "*Pharellus*" from Micronesia, and 9 previously undescribed New World species from Mexico, Central and South America. I can find no valid reasons for erecting or maintaining more than one genus for the species involved and so place *Pharellus* Sicard as a junior synonym of *Scotoscymnus* Weise. It is also possible that *Sukunahikona* Kamiya is congeneric with *Scotoscymnus* and may have to be placed in synonymy at some future time.

The most reliable characters for separation of the New World species of *Scotoscymnus* are the male and female genitalia and the pores, pits, and postcoxal lines on the abdomen. The genitalia require dissection, and, with the exception of *S. elongatus* and *S. globosus*, the species usually cannot be accurately identified without dissection.

The presence of both 9 and 10-segmented antennae in the same genus of Coccinellidae is unusual and would seem to indicate the possibility of more than one genus being present. However, I can find no other supporting reasons for establishing another genus and have not done so. The wingless condition is also unusual in this family, but 4 of the 9 New World species lack functional wings. Except in *S. pygmaeus,* the cryptotetramerous condition of the tarsi is difficult to detect because the third tarsal segment is so minute that it can be seen only under extremely high magnification. The species *S. elongatus, S. apterus, S. facetus,* and *S. globosus* all lack functional wings, possess 9-segmented antennae (club with a single segment), and lack pits on the first abdominal sternum. The species *S. colombianus, S. perpusillus, S. stephensi,* and *S. pygmaeus* have functional wings, possess 10-segmented antennae (club with 2 segments), and have pits on the first abdominal sternum. *S. orchidion* does not fit in either group because it has the 9-segmented antennae of the first group but also possesses the functional wings of the second group while the first abdominal sternum lacks pits.

Most of the specimens of *Scotoscymnus* available for study were collected by USDA Plant Protection Inspectors at various Quarantine stations. Consequently the locality data often consists of "intercepted Brownsville, Texas, ex. Mante, San Luis Potosi, Mexico", etc. This is obviously less than desirable data but unfortunately all that is available for some species.

The type series (2 specimens) of *Pharellus minutissimus* Sicard is in the collection of the British Museum (NH). I have examined the series and here designate and label the first one lectotype, the second specimen paralectotype. The specimens are labeled "syntype/type/predator on Chrysomphalus/T. Java 1926 T. H. C. Taylor/Pres. by Imp. Bur. Ent. Brit. Mus. 1927-439/Pharellus n.g. minutissimus Sic n.-sp. type".

Key to New World species of *Scotoscymnus*

1. Antennal club with one segment (fig. 8) 2
1′. Antennal club with 2 segments (fig. 7) 6
2(1). Form extremely elongate, dorsoventrally flattened (fig. 2); elytral punctures coarse deep, dense ..... *S. elongatus*, n. sp.
2′. Form oval or rounded, usually somewhat elongate, not flattened 3
3(2′). Form rounded (fig. 4); postcoxal line toothed (fig. 19) ..... *S. globosus,* n. sp.
3′. Form oval, somewhat elongate; postcoxal line not toothed except *orchidion*) 4
4(3′). Humeral callus present (fig. 6); functional wings present ..... *S. orchidion*, n. sp.
4′. Humeral callus lacking (fig. 2); functional wings absent 5

5(4′). Second abdominal sterna with large seta-bearing pores (fig. 18) ..... *S. facetus*, n. sp.
5′. Second abdominal sterna with very fine, indistinct punctures (fig. 17) ..... *S. apterus*, n. sp.

6(1′). Lateral margin of elytron slightly flared, not thickened or ridged (fig. 12) ..... *S. pygmaeus*, n. sp.
6′. Lateral margin of elytron thickened, expanded into a flat ridge (fig. 13) 7

7(6′). First abdominal sternum with inner postcoxal line extending anteriorly from pit, outer postcoxal line long, straight (fig. 21) ..... *S. stephensi*, n. sp.
7′. First abdominal sternum with inner postcoxal line terminated at pit, outer postcoxal line short, curved (fig. 22) 8

8(7′). Lateral ridge on elytron flat, without distinct, deep groove between ridge and disc of elytron ..... *S. perpusillus*, n. sp.
8′. Lateral ridge on elytron obliquely inclined, with distinct, deep groove between ridge and disc of elytron .... *S. colombianus*, n. sp.

Scotoscymnus pygmaeus Gordon, **new species**

Holotype.—Female, length 1.0 mm, greatest width 0.63 mm. Form oval, somewhat elongate (fig. 1), convex. Dark reddish brown; pronotum slightly paler, head yellowish brown; mouthparts, antennae, and legs yellow; apex of abdomen yellowish brown. Head shiny, coarsely punctured, punctures separated by a diameter or less. Pronotum smooth, polished, coarsely punctured, punctures separated by less than to twice a diameter; anterolateral line separated from anterolateral angle by width of basal antennal segment, joining lateral border. Elytron somewhat dull, alutaceous, punctures subequal in size to pronotal punctures, separated by a diameter or less; pubescence composed of more or less uniform, semi-erect hairs; lateral border feebly thickened, groove between border and disc shallow. Functional wing and humeral callus present. Third tarsal segment large, distinctly visible. Ventral surface smooth, polished, with some sparse pubescence becoming dense on last 2 abdominal sterna. Postcoxal line as in fig. 15. Genitalia with spermathecal capsule composed of a large, round, basal area and 2 smaller round areas (fig. 23).

Allotype.—Male, similar to holotype except for sexual characters. Genitalia with basal lobe curved, parameres extremely reduced (fig. 29); sipho short, feebly curved, bent before apex (fig. 30).

Type-material.—Holotype, La Ceiba, Honduras, March 21-20 (1920), W. M. Mann, on coconut (USNM 73765). Allotype, same data as holotype except date Feb. 29, 1920 (USNM). Paratypes, 4, same data as holotype except dates Feb. 29, 1920 and Mar. 3, 1920 (USNM).

Variation.—Length and width are the same in all specimens examined, but some are paler in color which is apparently a function of teneral condition.

Remarks.—The relatively close, even elytral punctation, uniform elytral pubescence, and lack of a pronounced lateral ridge on the elytron separate *S. pygmaeus* from the other winged species of *Scotoscymnus*. In addition, the relatively large third tarsal segment is unique to this species. The specific name is a Latin adjective meaning dwarfed or pygmy.

Scotoscymnus elongatus Gordon, **new species**

Holotype.—Female, length 1.20 mm., greatest width 0.60 mm. Form elongate, slender, flattened (fig. 2). Dark reddish brown; head yellowish brown; mouthparts,

antennae, and legs yellow; apex of abdomen yellowish brown. Head feebly shiny, surface alutaceous, coarse, indistinct punctures present, separated by a diameter or less. Pronotum apparently impunctate, finely alutaceous; anterolateral line very close to anterolateral angle, joining lateral border at midpoint. Elytron shiny, densely, coarsely punctured, punctures separated by 1/2 a diameter or less; pubescence uniform in length, composed of long, semi-erect hairs; lateral border thickened, forming a flat, wide ridge with deep groove between ridge and disc of elytron. Functional wing and humeral callus absent. Prosternum slightly expanded anteriorly (fig. 10). Ventral surface smooth, polished, with some sparse pubescence becoming dense on last 2 abdominal sterna. Postcoxal line as in fig. 16. Genitalia with spermathecal capsule as in fig. 24.

Allotype.—Male, similar to holotype except length 1.0 mm., width 0.55 mm. Genitalia with basal lobe flattened laterally, parameres very short (fig. 31); sipho as in fig. 32 (broken).

Type-material.—Holotype, intercepted Brownsville, Texas, ex. Mante, San Luis Potosi, Mexico, 29-III-1965, on orchid plants (USNM 73757). Allotype and 1 paratype, same data as holotype (USNM).

Variation.—The length and width vary as indicated for the holotype and allotype. The allotype is a light yellowish brown in color but this is because it is not a fully hardened specimen.

Remarks.—This is the most easily recognized member of the genus because of the extremely coarse elytral punctures and elongate form. In addition, the prosternum is slightly expanded anteriorly (fig. 10). The specific name is a Latin adjective referring to the elongate body form.

Scotoscymnus apterus Gordon, **new species**

Holotype.—Male, length approximately 1.0 mm. This specimen was completely dissected by E. A. Chapin and the parts mounted on a permanent slide. Because of this no accurate measurement of length or width can be made. Description as for *S. orchidion* except pronotum with extremely fine, nearly invisible punctures; functional wing and humeral callus absent. Postcoxal line as in fig. 17. Male genitalia with basal lobe long, laterally compressed (fig. 33); sipho slightly sinuate before apex, tip broken (fig. 34); *spiculum gastrale* large, robust (fig. 35).

Type-material.—Holotype, intercepted at Laredo, Texas, ex. San Luis Potosi, Mexico, Oct. 27, 1955, Watt collector, on orchids (USNM 73758).

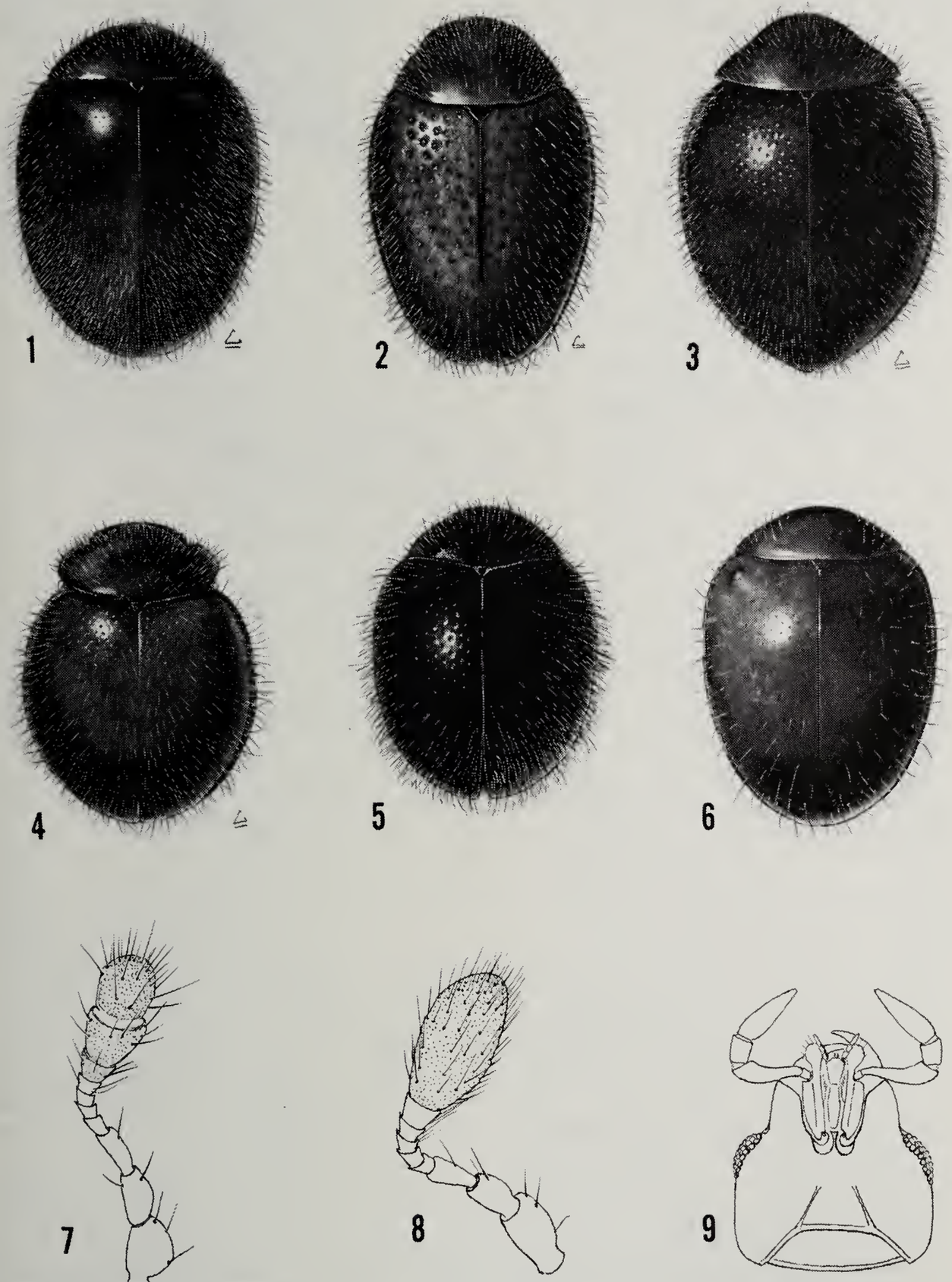
Remarks.—The unique male type is completely dissected as indicated above. As a result, it is difficult to compare this species with others represented by whole specimens. There do not appear to be any significant external differences between *S. apterus* and *S. orchidion* except that *S. apterus* lacks functional wings. The male genitalia are distinctive for each species. The specific name is a Latin adjective referring to the wingless condition.

Scotoscymnus facetus Gordon, **new species**

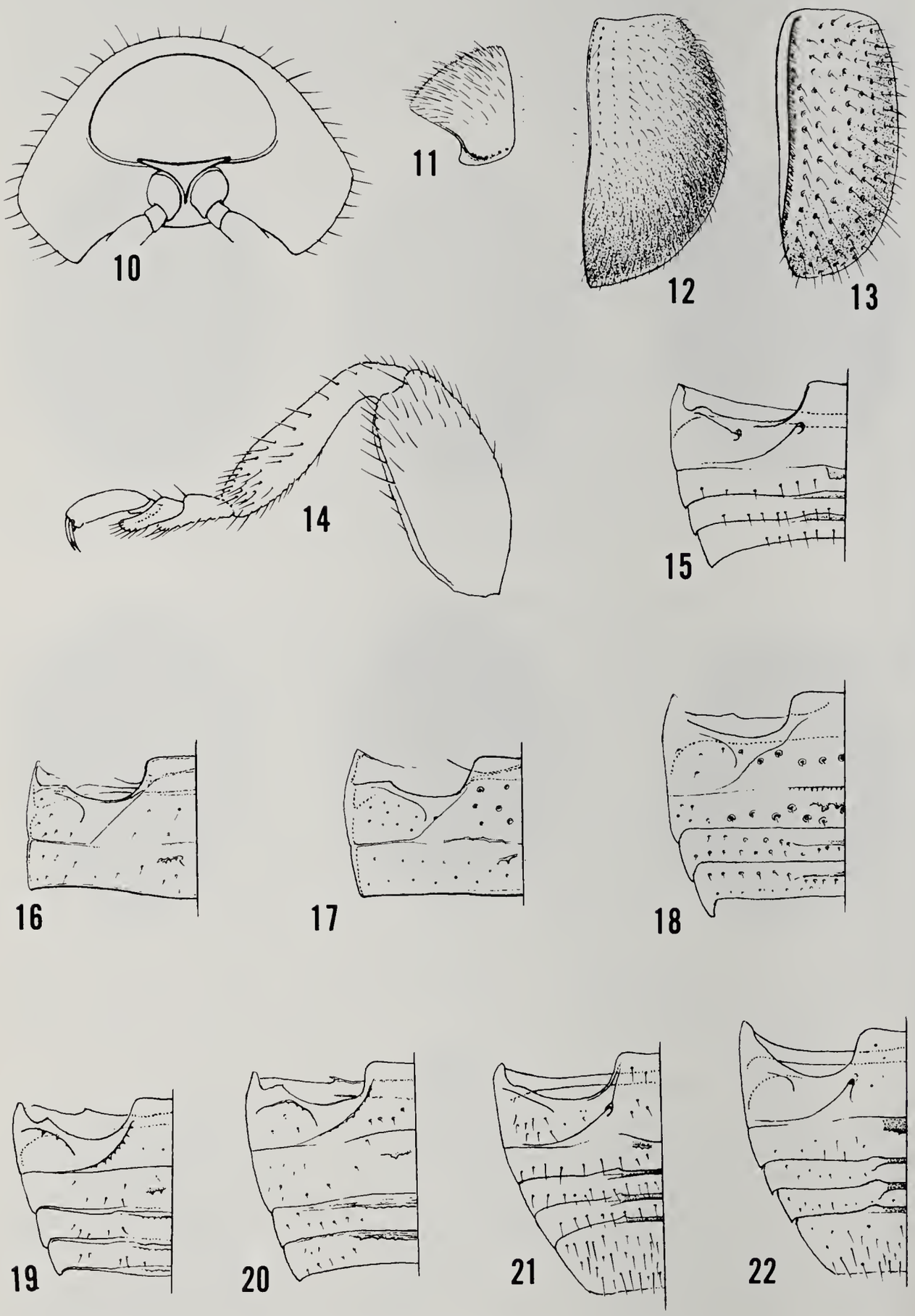
Holotype.—Female, length 1.05 mm, greatest width 0.63 mm. Form oval, somewhat elongate (fig. 3), convex. Dark reddish brown; head and pronotum yellowish red; mouthparts, antennae, and legs yellow; apex of abdomen yellowish brown. Head shiny, coarsely punctured, punctures separated by less than to twice a diameter. Pronotum polished, very finely punctured, punctures separated by 3 to 5 times a diameter; anterolateral line very close to anterolateral angle, joining lateral border. Elytron densely, coarsely punctured, punctures separated by their diameter or less; pubescence composed of short, erect hairs and interspersed, long, semierect hairs; lateral border thickened, forming a flat, wide ridge with deep groove between ridge and disc of elytron. Functional wing and humeral callus absent. Ventral surface smooth, polished, with few fine punctures, and sparse pubescence becoming dense on last abdominal sternum. Postcoxal as in fig. 18. Genitalia with spermathecal capsule as in fig. 26.

Type-material.—Holotype, Mexico, San Luis Potosi, Tamazunchale, May 4, 1958, on Philodendron (USNM 73759).

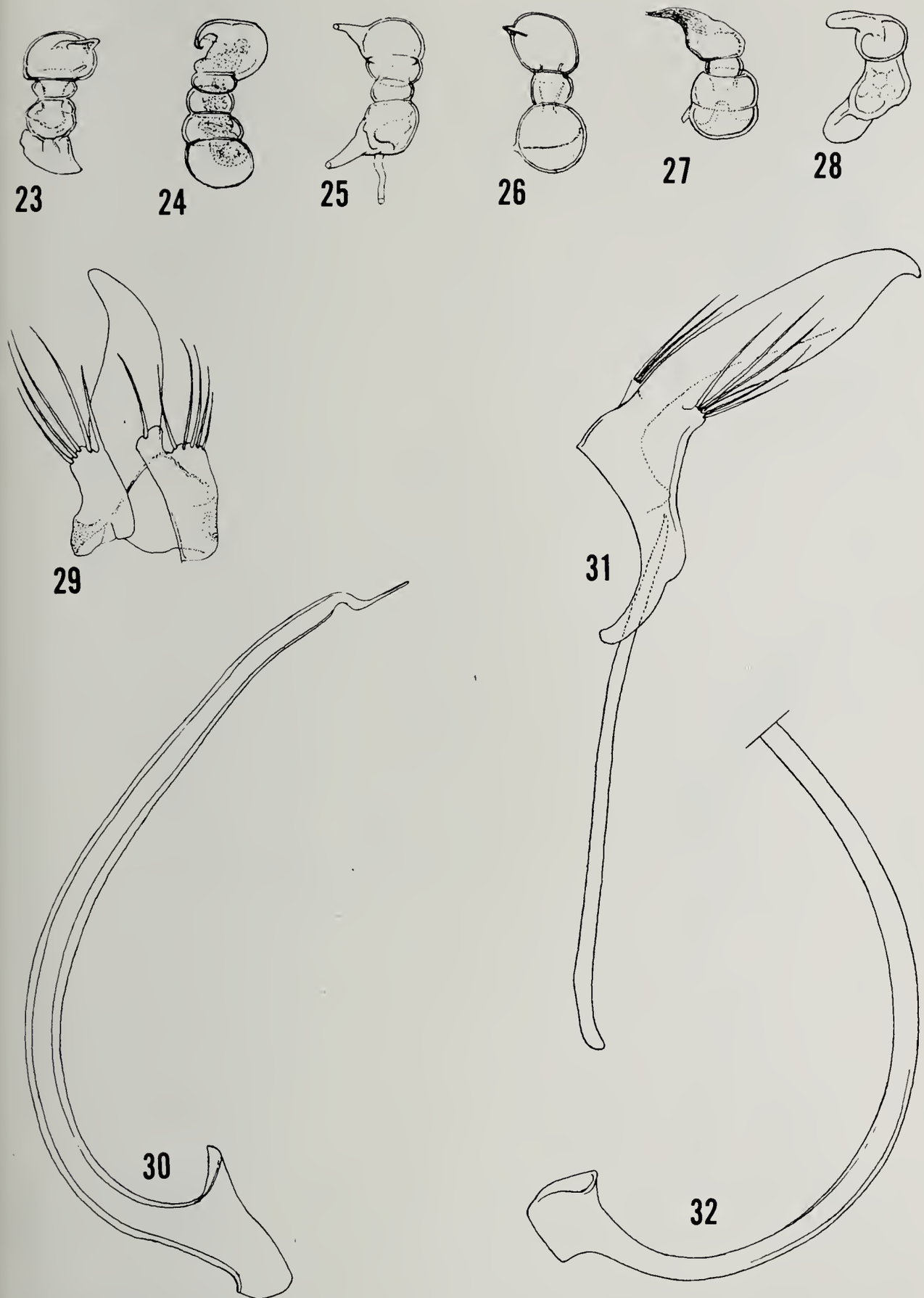
Remarks.—The coarse, dense elytral punctures are characteristic, resembling only *S. elongatus* in this respect. In addition, the very wide lateral elytral ridge and polished, nearly impunctate pronotum are characters shared only by *S. stephensi.* The sinuate inner postcoxal line is unlike that possessed by any described species. The specific name is a Latin adjective meaning fine, well made.



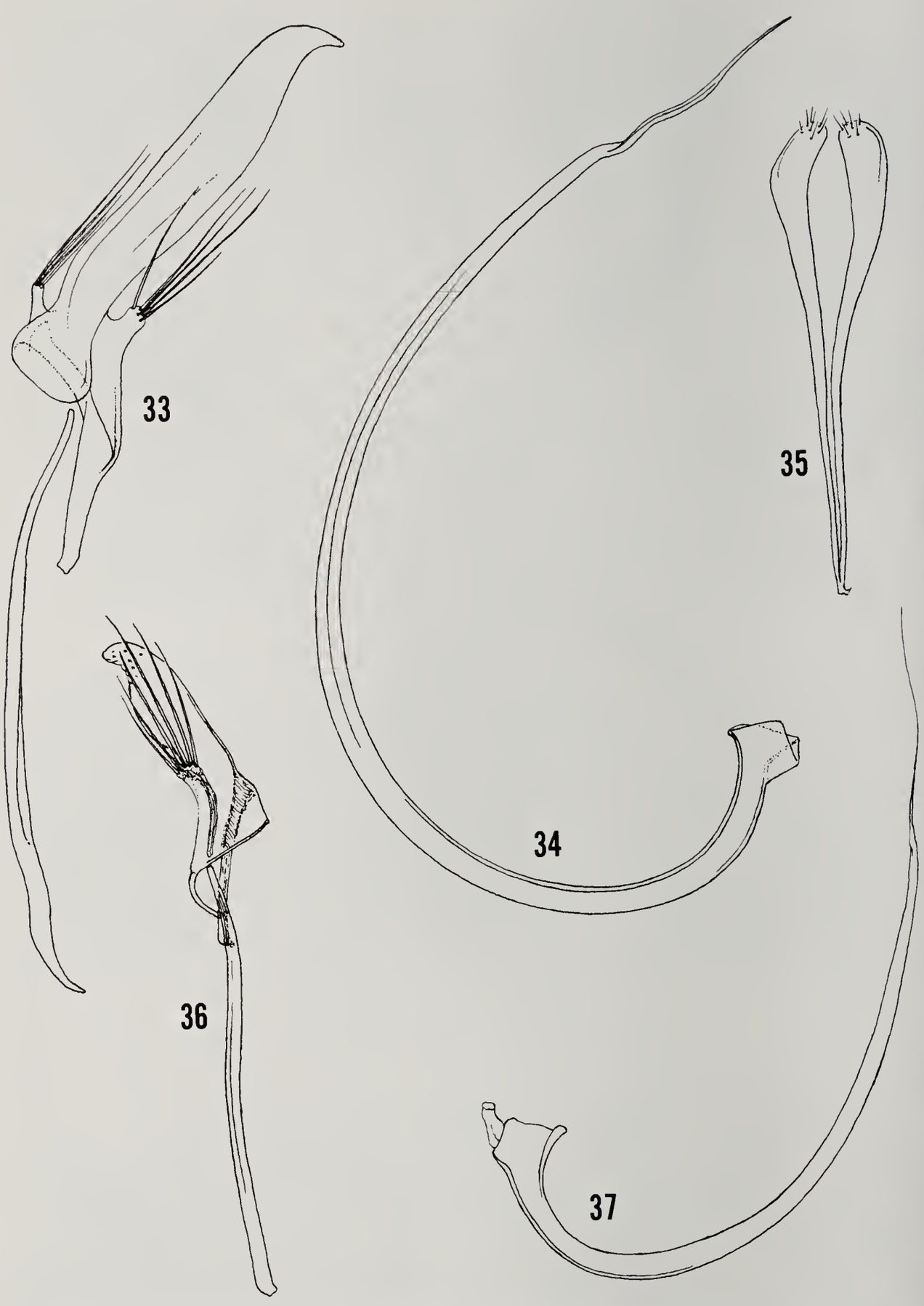
Figs. 1-9, *Scotoscymnus* species. figs. 1-6, habitus views: 1, *pygmaeus*; 2, *elongatus*; 3, *facetus*; 4, *globosus*; 5, *stephensi*; 6, *colombianus*. Figs. 7-9: 7, antenna, *pygmaeus*; 8, antenna, *elongatus*; 9, ventral view of head, *apterus.*



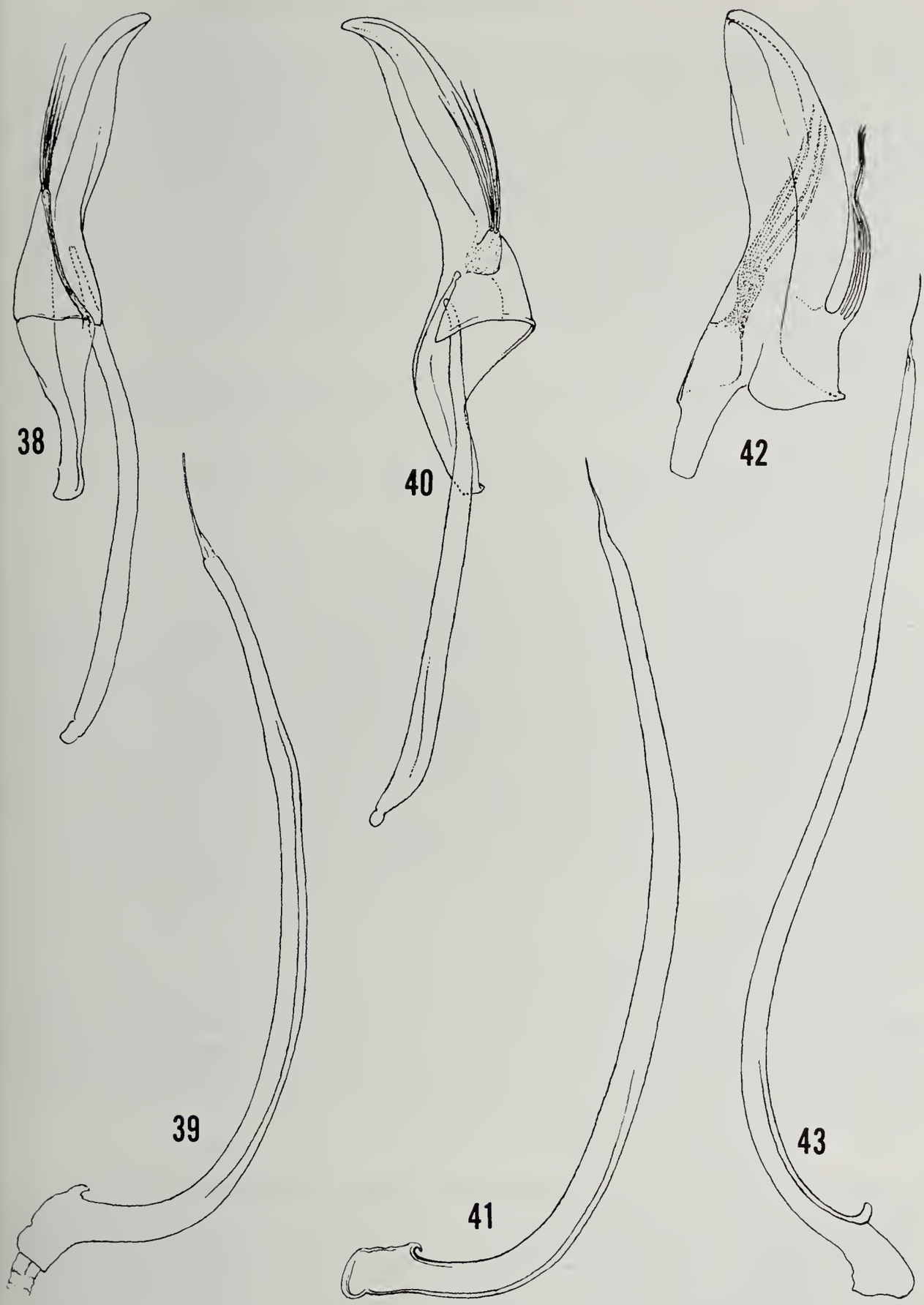
Figs. 10-22, *Scotoscymnus* species. Figs. 10-14: 10, prosternum, *elongatus*; 11, lateral view of pronotum, *pygmaeus*; 12, lateral view of elytron, *pygmaeus*; 13, lateral view of elytron, *elongatus*; 14, anterior leg, *elongatus*. Figs. 15-22, abdomens: 15, *pygmaeus*; 16, *elongatus*; 17, *apterus*; 18, *facetus*; 19, *globosus*; 20, *orchidion*; 21, *stephensi*, 22, *colombianus*.



Figs. 23-32, *Scotoscymnus* species. Figs. 23-28, spermathecae: 23, *pygmaeus*; 24, *elongatus*; 25, *globosus*; 26, *facetus*; 27, *stephensi*; 28, *colombianus*. Figs. 29-32, male genitalia; 29, 30, *pygmaeus*; 31, 32, *elongatus*.



Figs. 33-37. *Scotoscymnus* species, male genitalia: 33-35, *apterus*; 36, 37, *orchidion*.



Figs. 38-43, *Scotoscymnus* species, male genitalia: 38, 39, *stephensi*; 40, 41, *perpusillus*; 42, 43, *colombianus*.

Scotoscymnus globosus Gordon, **new species**

Holotype.—Female, length 0.82 mm, greatest width 0.66 mm. Form rounded (fig. 4), convex. Dark reddish brown: pronotum and head slightly paler; mouthparts, antennae and legs yellow; ventral surface yellowish brown. Head shiny, with moderately coarse punctures, punctures sparse, irregularly scattered. Pronotum shiny, finely punctured, punctures separated by 1 to 4 times a diameter; anterolateral line extremely close to anterolateraal angle, barely distinct from it, joining lateral border in apical 1/5. Elytron slightly alutaceous, punctures coarser than on head, separated by less than to twice a diameter; pubescence composed of intermixed long and short, erect hairs; lateral border moderately thickened, groove between border and disc shallow. Functional wing and humeral callus absent. Ventral surface smooth, polished, with some sparse pubescence becoming dense on last 2 abdominal sterna. Postcoxal line as in fig. 19. Genitalia with spermathecal capsule as in fig. 25.

Type-material.—Holotype, intercepted Laredo, Texas, ex. Mexico, 19-II-1970 (USNM 73760).

Remarks.—With the exception of *S. elongatus, S. globosus* is the most easily recognized of the New World species. The short, round form is characteristic, and the presence of toothed postcoxal lines (fig. 19) is similar only to that condition in *S. orchidion.* The specific name is a Latin adjective referring to the rounded body form.

Scotoscymnus orchidion Gordon, **new species**

Holotype.—Male, length 0.90 mm, greatest width 0.71 mm. Form oval, somewhat elongate, convex. Color dark reddish brown; head yellowish brown; mouthparts, antennae, and legs yellow; apex of abdomen yellowish brown. Head shiny, faintly alutaceous, punctures coarse, indistinct, separated by less than to twice a diameter. Pronotum faintly alutaceous, finely punctured, punctures separated by 2 to 4 times a diameter; anterolateral line widely separated from anterolateral angle. Elytron alutaceous, punctures coarser than on head, separated by a diameter or less; pubescence composed of intermixed long and short, semi-erect hairs; lateral border feebly thickened, groove between border and disc shallow. Functional wing and humeral callus present. Ventral surface smooth, polished, with some sparse pubescence becoming dense on last 2 abdominal sterna. Postcoxal line as in fig. 20. Genitalia with basal lobe thickened medially in lateral view, parameres short (fig. 36); sipho short, feebly curved (fig. 37).

Type-material.—Holotype, intercepted Brownsville, Texas, ex. Mexico, 4-IX-1946, with orchid plant (USNM 73761).

Remarks.—Male genitalia should be examined to accurately identify this species. Externally it resembles *S. pygmaeus* and *S. apterus* and is difficult to distinguish from either of those species without either dissection of the genitalia or examination for presence or absence of wings. The specific name is a Latin noun meaning orchid in the diminutive.

Scotoscymnus stephensi Gordon, **new species**

Holotype.—Male, length 1.0 mm., greatest width 0.62 mm. Form oval, somewhat elongate (fig. 5), convex. Color piceous; head and ventral surface dark reddish brown; mouthparts, antennae, and legs light yellowish brown. Head shiny, finely punctured, punctures separated by less than to 4 times a diameter. Pronotum smooth, polished, punctures finer than on head, separated by less than to 4 times a diameter; anterolateral line separated from anterolateral angle by width of basal antennal segment, joining lateral border; lateral border with wide, flat margin as in (fig. 13). Elytron shiny, faintly alutaceous, coarsely punctured, punctures separated by a diameter; pubescence composed of intermixed, erect long hairs and semi-erect short hairs; lateral border thickened, forming a flat, wide ridge with moderately deep groove between ridge and disc of elytron. Functional wing and humeral callus present. Ventral surface smooth, polished, finely punctured, punctures and pubescence becoming dense on last 3 abdominal sterna. Postcoxal line as in fig. 21. Geni-

talia laterally compressed, sinuate on ventral margin in lateral view (fig. 38); sipho feebly curved (fig. 39).

Allotype.—Female, similar to holotype except for sexual characters. Genitalia with spermathecal capsule composed of a large basal area, a small intermediate area and a median apical area (fig. 27).

Type-material.—Holotype, Panama, Boc. d. Toro, Changuinola, 20-VI-65, C.S.S. Stephens, on banana scale, (USNM 73762). Allotype and 1 paratype, same data as holotype (USNM). One paratype, ex. Costa Rica, 21-VI-1968, on orchids (USNM).

Varaiation.—The specimen from Costa Rica is slightly paler in color than the rest of the series.

Remarks.—The coarse elytral punctation and wide, flat, lateral margin on the pronotum are characteristic of this species. It most nearly resembles *S. facetus,* but *S. facetus* has a narrow pronotal margin and the antero-lateral pronotal line is extremely close to the angle. The postcoxal lines of both species are also distinctive (figs. 26, 27). This species is named for the collector of the type series.

Scotoscymnus perpusillus Gordon, **new species**

Holotype.—Male, length 1.0 mm, greatest width 0.63 mm. Form oval, somewhat elongate, convex. Black; pronotum dark reddish piceous, head slightly paler; mouth-parts, antennae, and legs brownish yellow; ventral surface dark reddish brown except apical abdominal sterna slightly paler. Head shiny, punctures very fine, barely perceptible. Pronotum shiny, alutaceous, punctures extremely fine, widely separated; anterolateral line separated from anterolateral angle by less than width of basal antennal segment, joining lateral border. Elytron shiny, faintly alutaceous, punctures fine but obvious, separated by 1 to 3 times a diameter; pubescence composed of intermixed long, erect hairs and short, semi-erect hairs; lateral border thickened, forming a flat, wide ridge, no groove present between ridge and disc of elytron. Functional wing and humeral callus present. Ventral surface smooth, polished, with some sparse pubescence becoming dense on last 2 abdominal sterna. Postcoxal line as described for *S. colombianus.* Genitalia similar to those of *S. stephensi* except apex of basal lobe more acute in lateral view (figs.40, 41).

Type-material.—Holotype, intercepted at New York, New York, ex. Colombia, VIII-1-1935, on banana (USNM 73763).

Remarks.—This species most nearly resembles *S. colombianus* except that the lateral elytral ridge in *S. colombianus* is not flat and *S. colombianus* has a distinct, deep groove between the ridge and the disc of the elytron.The male genitalia are very similar to those of *S. stephensi* but the elytral punctures of *S. stephensi* are at least twice the size of those possessed by *S. perpusillus* and are separated by a diameter. The specific name is a Latin adjective meaning very small.

Scotoscymnus colombianus Gordon, **new species**

Holotype.—Male, length 1.0 mm., greatest width 0.62 mm. Form oval, somewhat elongate (fig. 6), convex. Dark reddish piceous; head and pronotum a clear reddish brown; mouthparts, antennae, and legs yellowish brown; ventral surface dark reddish brown except apical abdominal sterna slightly paler. Head feebly shiny, surface alutaceous, punctures fine, sparse. Pronotum shiny, smooth, punctures coarser than on head, separated by less than to 3 times a diameter; anterolateral line separated from anterolateral angle by width of basal antennal segment, joining lateral border. Elytron shiny, faintly alutaceous, punctures coarser than on pronotum, separated by less than to twice a diameter; lateral border thickened, not flat, an obliquely angled ridge with deep groove between ridge and disc of elytron present. Functional wing and humeral callus present. Ventral surface smooth, polished, finely punctured, punctures and pubescence becoming dense on last 3 abdominal sterna. Postcoxal line as in fig. 22. Genitalia with basal lobe curved in ventral view, laterally flattened, broad in lateral view (fig. 42); sipho feebly curved near base, apical 3/4 nearly straight (fig. 43).

Type-material.—Holotype, intercepted at Miami, Florida, ex. Colombia, 1963, on orchids (USNM 73764).

Other material.—1 specimen, Colombia, Palmira, Valle del Cauca, 18-V-1939, 1085 m., Murillo (USNM).

Remarks.—See remarks under *S. perpusillus*. The male genitalia of *colombianus* are not closely similar to any species of *Scotoscymnus* described herein. The single female specimen listed under "other specimen" differs from the holotype in having the head more polished and distinctly punctured, the dorsal color a reddish brown. In other respects, it appears identical to the holotype. The female spermathecae of this specimen is illustrated in fig. 28. The specific name is a Latin adjective referring to the country of origin.

Tribe Microweisini

Microweisini: Leng 1920:213.—Sasaji 1968:20.
Pharini: Casey 1899:110.—Korschefsky 1931:209.—Pope 1962:267 (in part) (type-genus preoccupied).

Sticholotidinae with dorsal surface usually not pubescent, if so, then hairs of uniform length, size minute. Head capsule with prolonged frons and clypeus emarginate around antennal insertion (fig. 47); eye small, facets ranging from extremely coarse to fine; mandible without apical or basal teeth; apical segment of maxillary palpus slender, tapered at apex (fig. 59); antenna 7 to 10-segmented. Pronotum with oblique anterolateral line inside anterolateral angle (except *Gnathoweisea schwarzi*). Intercoxal process of prosternum broad, T-shaped (fig. 62). Leg simple, tibia unmodified; tarsus cryptotetramerous or trimerous. Functional wing present (except *Microcapillata*). Abdomen with 6 visible sterna; basal sternum with divided postcoxal lines (figs. 67, 68). Male genitalia asymmetrical, phallobase with unpaired, basal apodeme (fig. 72). Female spermathecal capsule bulbous (fig. 69).

This tribe is represented in the New World by 8 genera that occur from southern Canada to Chile and Argentina. Members of these genera are apparently all scale feeders, but specific host data are lacking for all genera except *Microweisea* and *Coccidophilus* as listed below. Host data seen for members of *Microweisea* include *Melanaspis obscura* (Comstock) (obscure scale); *Pseudaonidia duplex* (Cockerell) (camphor scale); *Quadraspidiotus perniciosus* (Cockerell) (San Jose scale); *Lepidosaphes beckii* (Newman) (purple scale); *Lepidosaphes* sp. Host data for *Coccidophilus* includes *Chionaspis pinifoliae* (Fitch) (pine needle scale); *Lepidosaphes beckii* (Newman) (purple scale); *Aspidiotus* sp.; *Aonidiella aurantii* (Maskell) (California red scale); *Pseudaulacaspis pentagona* (Targioni-Tozzetti) (white peach scale); *Chrysomphalus aonidium* (L.) (Florida red scale).

Microweisini is a closely knit group of genera agreeing quite well in all essential characteristics. The small size, characteristic habitus, the almost universal presence of an anterolateral line on the pronotum, divided postcoxal line, and broad, T-shaped intercoxal process of the prosternum serve to diagnose this tribe. All New World genera except *Microcapillata* and *Sarapidus* possess trimerous tarsi.

The tribal name Microweisini first appeared in the Leng checklist (1920, p. 213) but has not been used by subsequent authors. Prior to the preparation of this paper, I previously considered the New World genera such as *Microweisea* to belong in the Sticholotidini but here recognize Microweisini and Sticholotidini as discrete entities.

In addition to the New World genera discussed here, I have examined specimens of *Diloponis* Pope (South Africa) and cannot exclude it from Microweisini. The genus *Dichaina* Weise (Australia) also seems to belong in this tribe. I have not seen an example of *Dichaina* but the description places it here. Pope (1962) could not locate types or other specimens but thought that *Dichaina* must be allied to *Coccidophilus* and *Microweisea*, an opinion with which I concur.

Key to the New World genera of Microweisini

1. Head entirely concealed beneath pronotum (fig. 46) ..... *Nipus* Casey
1′. Head partially or not at all concealed 2

2(1′). Head partially concealed beneath pronotum, extremely elongate, slender (fig. 49) ..... *Gnathoweisea* Gordon
2′. Head not concealed beneath pronotum, usually short, if elongate then elytra pubescent 3

3(2′). Apical segment of maxillary palpus short, broad, obliquely truncate at apex (fig. 57); tarsus cryptotetramerous (fig. 65) ..... *Sarapidus*, n. gen.
3′. Apical segment of maxillary palpus not as described above; tarsus trimerous 4

4(3′). Elytron pubescent 5
4′. Elytron glabrous 6

5(4). Pubescence long, erect, sparse (fig. 45); Chile ..... *Stictospilus* Brèthes
5′. Pubescence short, erect, dense (fig. 44); Mexico ..... *Microcapillata*, n. gen.

6(4′). Antenna with 3-segmented club (fig. 52) ..... *Microweisea* Cockerell
6′. Antenna with 2-segmented club (fig. 53) 7

7(6′). Pronotum with longitudinal black mark ..... *Pseudosmilia* Brèthes
7′. Pronotum unicolorous ..... *Coccidophilus* Brèthes

Microcapillata Gordon, **new genus**

Microweisini with form elongate, oval; dorsum with short, dense pubescence. Head extremely prolonged anterior to antennal insertions (fig. 47); eye small, widely separated, very coarsely faceted; antenna with 7-segmented scape, 3-segmented club; apical segment of maxillary palpus slender, strongly narrowed apically. Prosternum with anterior lobe. Tarsus cryptotetramerous. Type-species: *Microcapillata clypealis*, new species.

The eyes in members of this tribe are often coarsely faceted, but those of *Microcapillata* are extremely so. The short, dense, dorsal pubescence is also unique as other hirsute genera such as *Stictospilus* and *Sarapidus* either have long hairs or, if short, then extremely sparse. The generic name is a combination of Latin terms meaning small and pubescent, and the gender is feminine.

Microcapillata clypealis Gordon, **new species**

Holotype.—Male, length 1.16 mm, greatest width 0.84 mm. Color mostly yellowish brown, elytron darker reddish brown. Dorsal surface completely pubescent, pubescence short, uniform individual hairs shorter than scutellum. Head dull, strongly alutaceous, finely punctured, punctures separated by 1 to 3 times their diameter. Pronotum dull, strongly alutaceous, finely punctured, punctures nearly invisible, separated by 1 to 3 times a diameter; anterolateral line widely separated from anterolateral angle, joining inner margin of wide lateral border. Elytron shiny, densely, finely punctured, punctures separated by a diameter or less. Functional wing lacking. Ventral surface smooth, polished, sparse pubescence present on abdominal sterna. Genitalia with phallobase short, broad; basal lobe bent to the left in ventral view (fig. 70); sipho as in fig. 71.

Type-material.—Holotype, interception, ex. Mexico, San Luis Potosi, Dec. '55, Watt, on orchids (USNM 73766).

Remarks.—The type was intercepted at the United States border and was found on orchids as were many of the specimens of *Scotoscymnus*. See remarks concerning this under the generic discussion of that genus. The specific name is a Latin adjective referring to the clypeus, gender is feminine.

Sarapidus Gordon, **new genus**

Microweisini with form elongate, oval; dorsum mostly glabrous except elytron with sparse, short, semi-erect hairs. Head slightly prolonged anterior to antennal insertion; eye separated by 5 times the width of an eye; apical segment of maxillary palpus short, broad, apex oblique (fig. 57); antenna with 7-segmented scape, 3-segmented club (fig. 50). Prosternum with small anterior lobe. Tarsus cryptotetramerous (fig. 65). First abdominal sternum with postcoxal lines nearly joined (fig. 67). Male genitalia with basal capsule and basal lobe asymmetrical, parameres symmetrical (fig. 72). Type-species: *Sarapidus australis*, new species.

The form of the apical maxillary segment and antennal club are unique within the Microweisini. In addition, the character of cryptotetramerous tarsi is shared only with *Microcapillata*. No biological information is available. The generic name is an anagram, and the gender is masculine.

Sarapidus australis Gordon, **new species**

Holotype.—Male, length 1.40 mm, greatest width 0.90 mm. Color piceous; elytron yellowish red with basal fourth and apical piceous. Dorsal surface sparsely pubescent, hairs as long as scutellum. Head shiny, faintly alutaceous, finely punctured, punctures separated by 3 to 6 times a diameter. Pronotum smooth, shiny, finely punctured, punctures separated by 2 to 4 times a diameter; anterolateral line widely separated from anterolateral angle, joining inner margin of narrow lateral border. Elytron shiny, faintly alutaceous, coarsely punctured, punctures separated by a diameter or slightly more. Functional wing present. Ventral surface smooth, polished, sparse pubescence present on abdominal sterna. Genitalia with basal lobe slightly asymmetrical; parameres symmetrical (fig. 72); sipho extremely long (fig. 73).

Type-material.—Holotype, Chile, Coll. Oyarzun (USNM 73825). Paratypes, 3, 2 with same data as holotype. One paratype, Chile, Magellanes, Punta Arenas, Dec. 4, 1954, T. Cekalovic (USNM).

Remarks.—This species occurs farther south (Punta Arenas) than any other coccinellid I have seen, and this may account for the lack of specimens present in collections. Both the habitus and male genitalia are distinctive, as are the maxillary palpi and tarsi. The specific name is a Latin adjective referring to the extreme southern distribution of this species.

Stictospilus Brèthes

Stictospilus Brèthes 1924:154.—Pope 1962:638. Type-species: *Stictospilus darwini* Brèthes, by monotypy.

Microweisini with form elongate, oval; dorsum with long, sparse, mostly erect hairs (fig. 45). Head slightly prolonged anterior to antennal insertion; eyes separated by less than 4 times the width of an eye; apical segment of maxillary palpus short, barrel-shaped (fig. 58); antenna with 7-segmented scape, 2-segmented club (fig. 51). Prosternum with extremely expanded anterior lobe (fig. 63). Tarsus trimerous.

Stictospilus is represented by an uncommonly collected species, *S. darwini* Brèthes. Nothing is known of the biology or preferred hosts. The presence of long, erect hairs on the dorsum is unique in this tribe and the strongly expanded prosternal lobe is similar only to that possessed by members of *Nipus*.

Because I have seen the type-series of *S. darwini* in the British Museum, I here take the opportunity to designate a lectotype and 2 paralectotypes. The lectotype is labeled "Syntype/Chiloe/Chiloe I. Chile C. Darwin/ Darwin Coll. 1885-119/Stictospilus darwini Brèthes". One paralectotype is labeled "Syntype/Paratype/Chili/Stictospilus darwini Brèthes". One paralectotype is labeled "Syntype/Valle del Lago Blanca. Patagonia 1903, 319/Stictospilus darwini Brèthes".

Microweisea Cockerell

Microweisea Cockerell 1903:38 (new name for *Episimilia* Cockerell 1900). Pope 1962:637.—Gordon 1970c:207. Type-species: *Smilia felschei* Weise, by monotypy.

Smilia Weise 1891:288 (not Germar 1833).

Episimilia Cockerell 1900:606 (not Fromental 1861) (new name for *Smilia* Weise).

Pseudoweisea Schwarz 1904:118. Name made available by accident.

Microweisini with form elongate, oval; dorsum glabrous. Head slightly prolonged anterior to antennal insertion (fig. 48); eyes separated by 4 times the width of an eye; apical segment of maxillary palpus elongate, slender, conical; antenna with 7-segmented scape, 3-segmented club (fig. 52). Prosternum with small anterior lobe. Tarsus trimerous (fig. 66). Male genitalia asymmetrical, parameres reduced (fig. 74).

Microweisea was reviewed by Gordon (1970c) and contained 5 species from America north of Mexico. I have since seen several undescribed species from Mexico and South America. This genus is very close to *Coccidophilus*, but at present the differences between them seem sufficient to warrant their continued separation.

Coccidophilus Brèthes

Coccidophilus Brèthes 1905:1.—Costa Lima 1941:409.—Pope 1962:638.—Gordon 1970c:213. Type-species: *Coccidophilus citricola* Brèthes, by monotypy and original designation.

Cryptoweisea Gordon 1970c:213. Type-species: *Pentilia marginata* Le Conte. **New synonymy.**

Microweisini with form elongate, oval; dorsum apparently glabrous. Head slightly prolonged anterior to antennal insertion; eyes separated by 4 times the width of an eye; apical segment of maxillary palpus usually short, barrel shaped (fig. 58), but often elongate, conical; antenna with 7-segmented scape and 2-segmented club (fig. 53). Prosternum with small anterior lobe (fig. 62). Tarsus trimerous. Male genitalia asymmetrical, parameres reduced (figs. 75, 76).

Coccidophilus has not been reviewed since 1941 when Costa Lima discussed both *Coccidophilus* and *Pseudosmilia*. There are several undescribed species present in South America. I here add the 3 species previously placed in *Cryptoweisea* Gordon. The differences between *Coccidophilus* and *Cryptoweisea* cited by Gordon (1970c) are not constant when South American species are examined, and I here place *Cryptoweisea* as a junior synonym of *Coccidophilus*. I have not seen any examples of this genus from Central America, and there seems to be a gap in distribution between the United States and South America except for a single species occuring in Baja California.

Pseudosmilia Brèthes

Pseudosmilia Brèthes 1924:157.—Costa Lima 1941:409.—Pope 1962:638. Type-species: *Pseudosmilia arrowi* Brèthes, by monotypy.

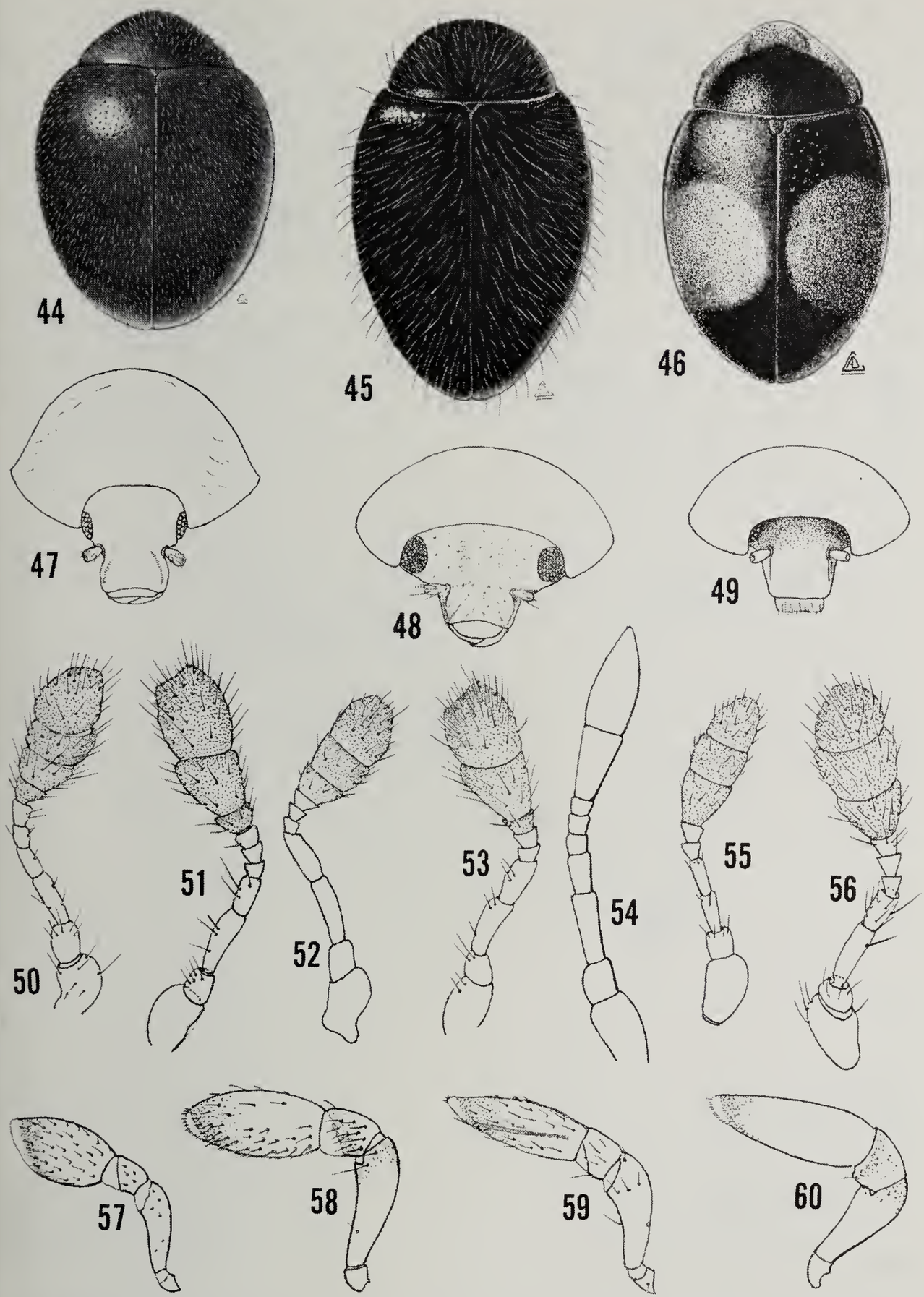
There is little doubt that this monotypic genus is close to *Coccidophilus,* and the 2 may be congeneric. The type of *Pseudosmilia arrowi* is supposed to be in the British Museum, but all that remains there is a pin with the specimen missing labeled "Type". I have not seen specimens from Chile (the type-locality) or elsewhere that match the original description, and in the absence of such specimens I maintain *Pseudosmilia* as a valid genus. Brèthes described *P. arrowi* as being somewhat pubescent and darkly ferruginous with a longitudinal black mark on the pronotum and a black patch around the scutellum. He also illustrated the antenna (fig. 54) which appears quite different from that of *Coccidophilus* (fig. 53), but if the antennae of *Coccidophilus* are viewed from the side rather than dorsally or ventrally, then they somewhat resemble Brèthes illustration.

Gnathoweisea Gordon

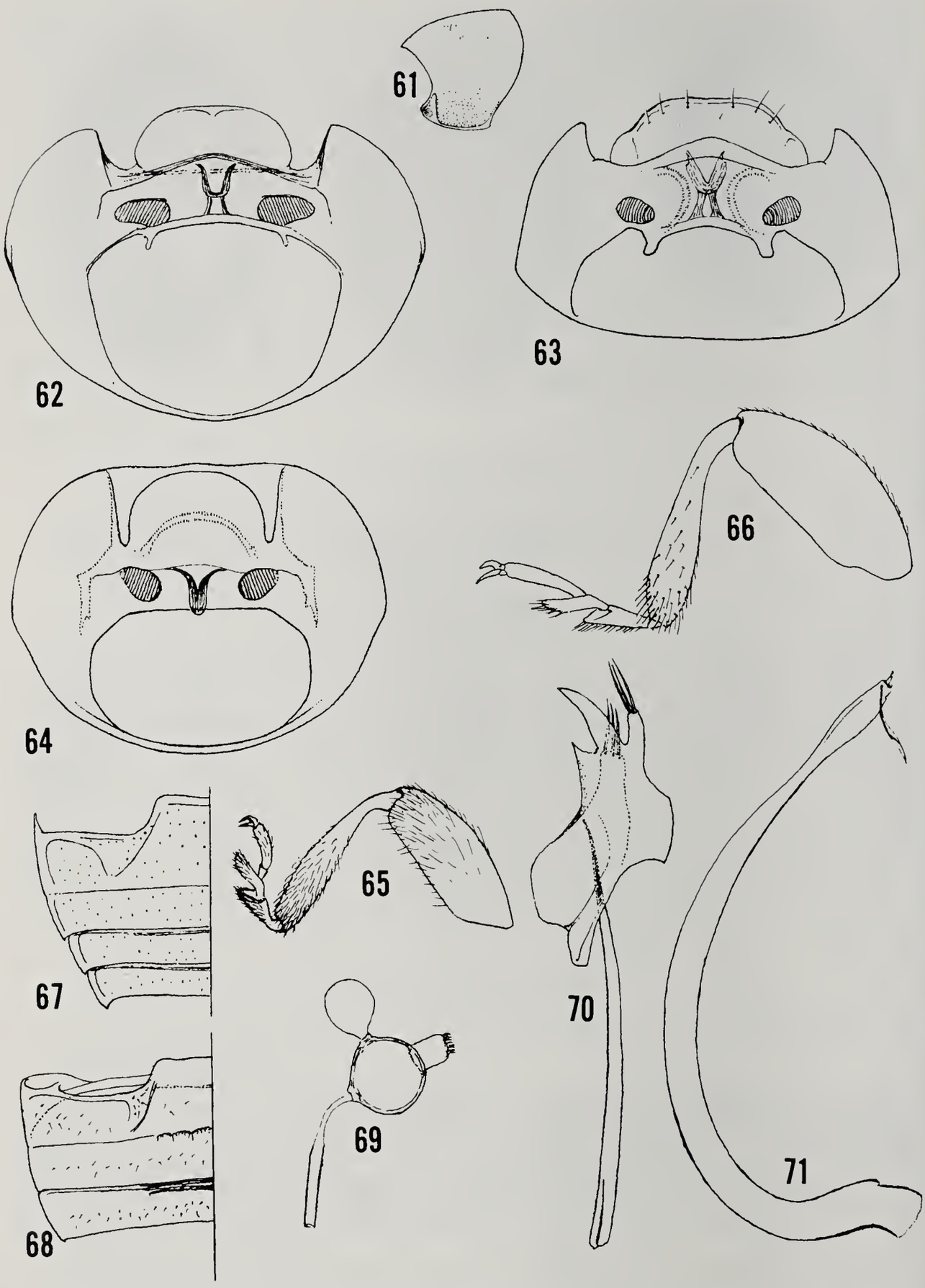
Gnathoweisea Gordon 1970:47. Type-species: *Smilia planiceps* Casey, by original designation.

Microweisini with form elongate, oval, pronotum partially covering head; dorsum glabrous. Head extremely elongate anterior to antennal insertion, lateral border margined (fig. 49); eyes separated by 6 times the width of an eye, very coarsely faceted; apical segment of maxillary palpus elongate, slender, conical; antenna with 6-segmented scape, 3-segmented club (fig. 55). Prosternum with or without anterior lobe. Tarsus trimerous. Male genitalia asymmetrical, parameres somewhat reduced.

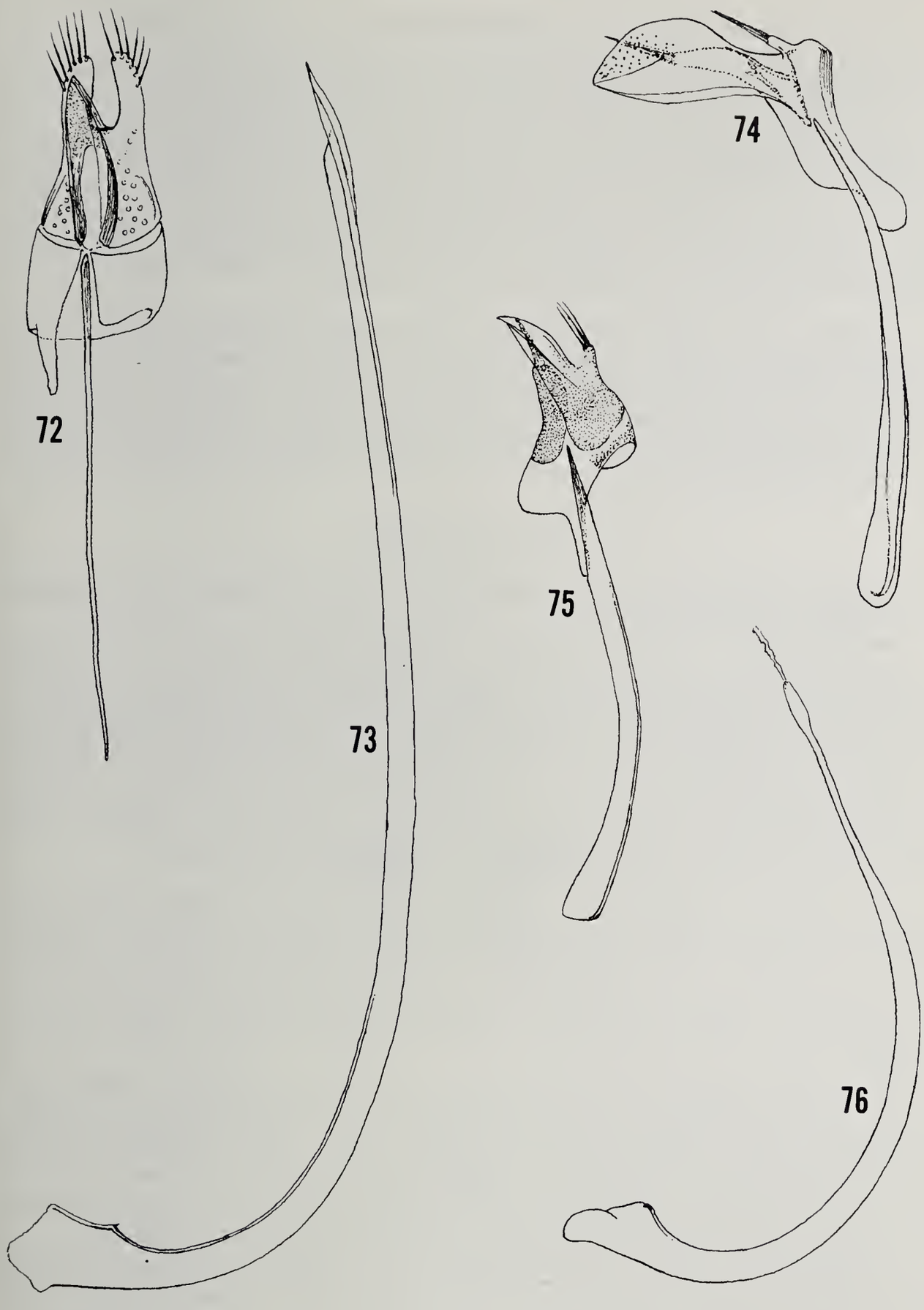
This genus was treated by Gordon (1970b) and contains 2 described species from Arizona and California. The preferred hosts are unknown, but *G. planiceps* has been taken from *Pinus monophylla* and evidently must feed on a scale infesting that tree. The partially covered head is a condition intermediate between those of *Microweisea* and *Nipus*. The presence of lobed and unlobed prosterna within the same genus of Microweisini seems incongruous, but I can find no other substantive supporting differences and prefer to consider the 2 species as congeneric.



Figs. 44-60. Figs. 44-46, habitus views: 44, *Microcapillata clypealis*; 45, *Stictospilus darwini*; 46, *Nipus occiduus*. Figs. 47-49, heads: 47, *Microcapillata clypealis*; 48, *Microweisea misella*; 49, *Gnathoweisea planiceps*. Figs. 50-56, antennae: 50, *Sarapidus* sp.; 51, *Stictospilus darwini*; 52, *Microweisea misella*; 53, *Coccidophilus* sp.; 54, *Pseudosmilia arrowi*; 55, *Gnathoweisea planiceps*; 56, *Nipus occiduus*. Figs. 57-60, apical segment of maxillary palpi: 57, *Sarapidus australis*; 58, *Stictospilus darwini*; 59, *Microweisea misella*; 60, *Coccidophilus* sp.



Figs. 61-71. Fig. 61, lateral view of pronotum, *Microweisea misella*. Figs. 62-64, prosterna: 62, *Coccidophilus* sp.; 63, *Stictospilus darwini*; 64, *Nipus biplagiatus*. Figs. 65-71: 65, leg. *Sarapidus australis*; 66, leg, *Microweisea misella*; 67, abdomen, *Sarapidus australis*; 68, abdomen, *Microweisea misella*; 69; spermatheca, *Microweisea misella*; 70, 71, male genitalia, *Microcapillata clypealis*.



Figs. 72-76, male genitalia: 72, 73, *Sarapidus australis*; 74, *Microweisea misella*; 75, 76, *Coccidophilus* sp.

Nipus Casey

Nipus Casey 1899:132.—Gordon 1970a:71. Type-species: *Nipus biplagiatus* Casey, by subsequent designation of Korschefsky 1931.

Microweisini with form oval; dorsum glabrous or partially pubescent; pronotum completely concealing head (fig. 46). Head strongly elongate anterior to antennal insertion (not as elongate as in *Gnathoweisea*); eyes separated by 3 times the width of an eye; apical segment of maxillary palpus elongate, somewhat conical; antenna with 7-segmented scape, 3-segmented club (fig. 56). Prosternum with anterior lobe pronounced, semicircular, nearly concealing mouthparts ventrally (fig. 64). Tarsus trimerous. Male genitalia asymmetrical, parameres reduced.

Nipus was reviewed by Gordon (1970a) and contains 4 species from Arizona and California. No information is available concerning the preferred hosts. This genus is readily distinguished from other genera of Microweisini because the head is completely concealed beneath the pronotum. The partially concealed head found in *Gnathoweisea* is the only remotely similar condition known.

Tribe Serangiini

Serangiini: Blackwelder 1945:450.—Pope 1962:627.—Sasaji 1967:2—Sasaji 1968:20.—Gordon 1970d:356.

Sticholotidinae with form compact; dorsally pubescent or not. Head slightly prolonged anterior to antennal insertion, emarginate around insertion; eye coarsely faceted (fig. 77); apical segment of maxillary palpus either elongate, conical, or short, barrel shaped; antenna 8 or 9-segmented, club composed of a single segment (figs. 78, 79). Prosternum strongly lobed anteriorly, concealing mouthparts (fig. 77), notched on each side for reception of antenna. Epipleuron with fovea for reception of leg. Leg received in deep cavity on ventral surface; at least front femur broad, flat, concealing tibia when leg retracted; at least front tibia angulate externally; tarsus cryptotetramerous or trimerous. Abdomen with 5 visible sterna; postcoxal line on first sternum complete. Male genitalia asymmetrical, parameres reduced.

This tribe is represented in the New World by the native genus *Delphastus* and an introduced genus and species, *Catana clauseni* Chapin. *Catana clauseni* occurs only in Cuba where it was intentionally introduced for control of the citrus blackfly (*Aleurocanthus woglumi* Ashby). The area of origin was Indonesia, and the introduction was made in 1930 (Chapin, 1940).

Delphastus was reviewed by Gordon (1970d) and contains 12 species distributed from southern Canada to Argentina. Available host records for *Delphastus* are: *Aleurocanthus woglumi* Ashby (citrus blackfly); *Pelius kelloggi* (Bemis); *Trialeurodes floridensis* (Quaintance). These hosts are all whiteflies (Aleyrodidae), and available evidence on host selection in the Serangiini indicates that they are mostly restricted to whiteflies.

A series of a species of *Delphastus* in the USNM collection bears the host data "on *Asterolecanium miliaris* (Boisduval)" (a scale insect). Kamiya (1966) records *Serangium japonicum japonicum* Chapin as feeding on the scales *Ceroplastes rubens* Maskell and *Ceroplastes japonicus* Green in Japan.

There are currently 6 genera placed in this tribe, all of Oriental origin except *Delphastus*. Miyatake (1961) provided a key to the 5 Oriental genera. Chapin (1940) and Miyatake (1961) have provided excellent illustrations of the pertinent morphological details of members of this tribe, and I have not repeated them here.

KEY TO GENERA OF WESTERN HEMISPHERE SERANGIINI

1. Antenna 8-segmented (fig. 79); middle and hind tibiae not angulate externally ..... *Catana* Chapin
1'. Antenna 9-segmented (fig. 78); middle and hind tibiae angulate externally ..... *Delphastus* Casey

Catana Chapin

Catana Chapin 1940:266. Type-species: *Catana clauseni* Chapin, by original designation.

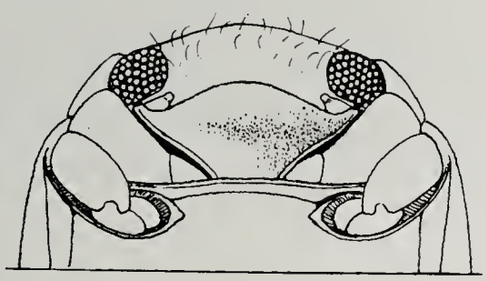
Serangiini with nearly hemispherical form. Head with apical segment of maxillary palpus barrel-shaped; antenna 8-segmented (fig. 79). Elytron without sutural line. Epipleuron slightly descending externally. Leg with femur broad; tibia slender, middle and hind tibiae not angulate externally; tarsus cryptotetramerous.

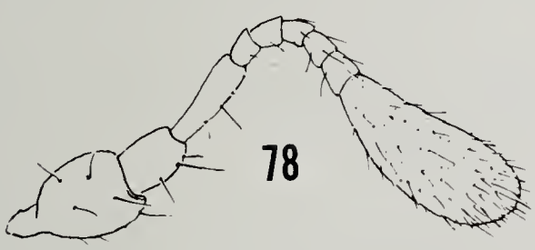
There are approximately 5 described species in this genus, all oriental, with one species introduced into Cuba as indicated in the tribal discussion.

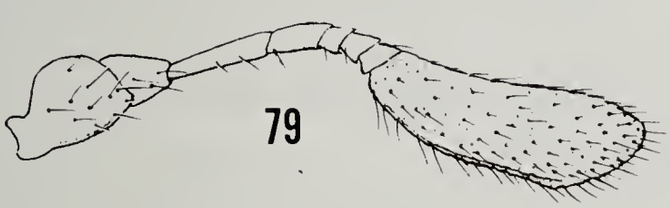
Delphastus Casey

Delphastus Casey 1899:111.—Korschefsky 1931:220.—Chapin 1940:264.—Gordon 1970d:357. Type-species: *Oeneis pusillus* LeConte, by subsequent designation of Korschefsky 1931.

Serangiini with form hemispherical, slightly elongate. Head with apical segment of maxillary palpus slender, somewhat conical; antenna 9-segmented (fig. 78). Elytron without sutural line. Epipleuron not descending externally. Leg with femur broad; tibia angulate externally; tarsus trimerous.







Figs. 77-79. Fig. 77, ventral surface of prosternum, *Delphastus pusillus*; 78, antenna, *Delphastus pusillus*; 79, antenna, *Catana clauseni*.

Delphastus is very similar to *Catana* in appearance but the key characters as well as the difference in tarsal segments will readily separate them. Members of *Delphastus* occur only in the New World and the 12 described species occur mostly from Mexico and the West Indies southward. One species, *Delphastus pusillus* (LeConte), is widespread in the United States and occurs as far north as Michigan.

Tribe Sticholotidini, **emendation**

Sticholotini: Weise 1901:430.—Sasaji 1967:11.—Sasaji 1968:19.
Pharini: Casey 1899:110.—Korschefsky 1931:209.—Pope 1962:627 (in part) (type genus preoccupied).
Pseudococcinellidae: Weise 1887:185.—Weise 1893:105.—Weise 1899:372.—Sicard 1907:426.—Sicard 1909:150 (not available, no type-genus).
Coelopterini: Della Beffa 1912:171.—Korschefsky 1931:209.
Coelopterina: Jacobson 1904-1916 (1916):969.—Korschefsky 1931:209.

Sticholotidinae, form subhemispherical; dorsally pubescent or glabrous. Head with anterior clypeal margin usually more or less truncate, gena rarely extending onto eye above antennal insertion (*Lotis, Glomerella*). Antenna inserted under clypeus anterior to eye or insertion exposed. Pronotum without line or ridge separating anterolateral angle from disc. Scutellum visible but reduced in *Glomerella*. Elytron confusedly punctured with surface usually polished, shiny. Functional wing usually present. Prosternum usually with longitudinal ridges on process between front coxae, anterior margin of prosternum often produced downward or slightly projecting. Epipleuron flat or descending externally, foveate or not for reception of femur. Abdomen with 5 visible sterna. Leg with tarsal claw simple or nearly so. Male genitalia usually symmetrical.

With the recognition of the tribes Sukunahikonini and Microweisini, the Sticholotidini become a slightly more compact entity, with somewhat definable characteristics. I have not studied the Old World genera in detail, but it is apparent from a cursory examination that this tribe is composed of a heterogenous assemblage of genera. When a thorough study is undertaken, new tribes will certainly have to be formed to include genera now in the Sticholotidini.

I recognize 4 genera of new world Sticholotidini, 3 of which are described here for the first time. None are comprised of more than 3 species, and the species are usually represented by severely limited type material. This suggests that there still remain other undescribed genera and species in the Neotropical Region. The known genera form a diverse assemblage, but I suspect that genera as yet unrecorded will at least partially close existing gaps in the scheme.

I previously (1970e) assigned the genus *Microscymnus* to the Sticholotidini, but, after reassessment of the characteristics of that genus, I now exclude it. The affinities of *Mycroscymnus* are not readily apparent but are most likely with *Pentilia* and *Crytognatha* in the Cryptognathini.

KEY TO GENERA OF NEW WORLD STICHOLOTIDINI

1. Form extremely convex (fig. 84); epipleuron foveate for reception of femur ..... *Glomerella*, n. gen.
1′. Form normally convex; epipleuron not foveate for reception of femur 2

2(1′). Apical segment of maxillary palpus long, slender, strongly narrowed apically (fig. 85) ..... *Nexophallus* Gordon
2′. Apical segment of maxillary palpus wide, not strongly narrowed apically 3

3(2′). Prosternum with intercoxal process somewhat triangular, strongly raised (fig. 98) ..... *Neotina*, n. gen.
3′. Prosternum with intercoxal process rectangular, slightly raised (fig. 92) ..... *Nesina*, n. gen.

Nexophallus Gordon

Nexophallus Gordon 1969:93. Type-species: *Nexophallus semiglobus* Gordon, by original designation.

Sticholotidini with form round, strongly convex (fig. 80); dorsum faintly pubescent. Head broad (fig. 89); clypeus short, truncate anteriorly; eyes small, widely separated; antenna inserted under anterior angle of clypeus anterior to eye; antenna with scape 7-segmented, club 3-segmented; mandible with 2 teeth; apical segment of maxillary palpus long, slender, narrowed apically (fig. 85). Epipleuron broad basally, slightly descending externally, not foveate for reception of femur. Prosternum with small anterior projection, posterior projection rectangular, widely separating middle coxae. Legs with all femora swollen and grooved for reception of tibiae; all tibiae thickened medially; tarsus cryptotetramerous. Abdomen with 5 visible sterna, first sternum with complete postcoxal lines. Functional wing present. Male genitalia symmetrical or asymmetrical.

With the new species described herein there are 3 species in *Nexophallus*. All are from South America (Bolivia, Ecuador and Brazil) and form a compact genus based on external characters. The male genitalia are extremely different in each species, showing no apparent relationship with one another. See Gordon (1969) for a discussion of the genus and illustrations of morphological characters. *Nexophallus* is the only new world genus of Sticholotidini thus far described possessing the strongly narrowed apical segment of the maxillary palpus, somewhat resembling the genera of Microweisini in this respect. *Nexophallus* most nearly resembles the Old World genus *Sticholotis* as discussed by Gordon (1969).

KEY TO SPECIES OF *Nexophallus*

1. Head and pronotum rufous ..... *N. rufoglobus* Gordon
1′. Head and pronotum black 2

2(1′). Elytral punctures fine, nearly invisible ..... *N. semiglobus* Gordon
2′. Elytral punctures coarse, separated by a diameter or less ..... *N. lindemanni*, n. sp.

Nexophallus lindemanni Gordon, **new species**

Holotype.—Female, length 2.10 mm, greatest width 1.75 mm. Form convex, round (fig. 82). Color rufopiceous; head, pronotum, and legs black; mouthparts and antennae brownish yellow. Head shiny, faintly alutaceous, densely punctured, punctures separated by a diameter or less. Pronotum shiny, faintly alutaceous, punctures equal in size to those on head, separated by 1 to 2 times a diameter. Elytron smooth, polished, densely punctured, punctures slightly coarser than on pronotum, separated by a diameter or less. Prosternum with intercoxal process rough, deeply punctured. Mesosternum with intercoxal area strongly margined anteriorly, deeply punctured. Metasternum with coarse punctures scattered throughout, surface alutaceous. First abdominal sternum with postcoxal line complete, extending slightly more than half the distance to hind margin. Genitalia with spermathecal capsule bent at right angle, sperm duct extremely long, tangled (fig. 88).

Allotype.—Male, similar to holotype in all respects except sexual characters. Genitalia with phallobase slender, symmetrical, parameres half as long as basal lobe; trabes longer than phallobase (fig. 86); sipho with extremely long, coiled apical portion (fig. 87).

Type-material.—Holotype, Brazil, Amazonas, Serra Neblina, N. Rio Cauaburi, 125 mm, 2-IV-1964, C. Lindemann (ZSBS). Allotype and 1 paratype, same data as holotype (USNM) (ZSBS).

Remarks.—The key characters are sufficient to separate the 3 described species in this genus, but in addition, the male genitalia are also extremely different in all 3. The extremely elongate, threadlike, apical portion of the sipho of *N. lindemanni* is very unusual, and the female sperm duct is a correspondingly long, slender structure. This species is named for the collector of the type series.

Nesina Gordon, **new genus**

Sticholotidini with form nearly round, convex, head and pronotum very sparsely pubescent (fig. 81). Head broad, clypeus short, truncate apically; eye large, finely faceted, inner half divided by lateral extension of clypeus, separated by twice the width of an eye (fig. 90); antenna inserted under anterior angle of clypeus anterior to eye; mandible with 2 teeth; apical segment of maxillary palpus short, broad, narrowed toward apex (fig. 91). Elytral epipleuron broad, slightly descending externally, not foveate for reception of femur. Prosternum short, not lobed anteriorly, coxae widely separated (fig. 92). Legs with all femora swollen and grooved for reception of tibiae; tarsus cryptotetramerous. Abdomen with 5 visible sterna, first sternum with complete postcoxal line. Functional wing present. Male genitalia symmetrical. Type-species: *Nesina amazonia*, new species.

The shape of the apical segment of the maxillary palpus is quite different from that found in other new world genera of Sticholotidini, but similar to some old world genera such as *Lotis*. The expansion of the clypeus onto the eye is also a character shared by *Lotis* and *Habrolotis*. The affinities of *Nesina* seem to be with *Lotis* and related genera, most of which possess strongly descending elytral epipleura. *Nesina* has the epipleura slightly descending and lacks the associated foveae for reception of the legs. If *Nesina* and this group of old world genera share a common ancestry, then the split in lineage is an ancient one.

The generic name is an arbitrary combination of letters, and the gender feminine.

Nesina amazonia Gordon, **new species**

Holotype.—Female, length 1.30, greatest width 1.05 mm. Form round, slightly elongate, convex (fig. 81). Head and pronotum with sparse, white pubescence. Color black; elytra dark piceous; ventral surface reddish brown. Head feebly shiny,

alutaceous, punctures fine, separated by a diameter. Pronotum shiny, faintly alutaceous, punctures coarser than on head, separated by less than a diameter. Elytron smooth, polished, coarsely punctured, punctures separated by a diameter or less; lateral border feebly, narrowly margined, a row of short, sparse setae present inside margin. Meso- and metasternum coarsely, densely punctured, surface shiny. Abdomen with postcoxal line complete, extending nearly to apex of first sternum (fig. 93). Spermathecal capsule lost.

Allotype.—Male, similar to holotype except for sexual characters. Genitalia with phallobase short, basal lobe slender, straight, longer than paramere (fig. 94); sipho short, robust (fig. 95).

Type-material.—Holotype, Brazil, Amazonas, Serra Neblina, N. Rio Cauaburi, 7700 m, 9-II-1964, C. Lindemann (SZBS). Allotype, Brasilien, Amazonas, Vaupés, Rió Negro 18, 3-II-1964, Chr. Lindemann (USNM).

Remarks.—The type specimens are in poor condition apparently because some deterioration of the intersegmental membranes has taken place prior to mounting. Most of the legs and all antennae are missing.

The specific name is a Latin adjective referring the locality of origin.

Neotina Gordon, **new genus**

Sticholotidini, with form rounded, convex (fig. 82), without pubescence except on lateral margin of elytron. Head broad; clypeus short, nearly truncate apically, anterolateral angles rounded; eye not extremely coarsely faceted, small, separated by 5 times the width of an eye (fig. 96); antenna inserted under anterior angle of clypeus anterior to eye, scape 7-segmented, club 3-segmented (fig. 97); mandible with 2 teeth; apical segment of maxillary palpus short, broad, apex strongly, obliquely angled to produce acute apex. Epipleuron broad, slightly inclined, not foveate for reception of femora. Prosternum with coxae widely separated by a triangular protuberance, not lobed anteriorly (fig. 98). Legs with all femora swollen and grooved for reception of tibiae; tibiae slender, nearly straight; tarsus cryptotetramerous, robust, with dense hairs on ventral surface. Abdomen with 5 visible sterna, first sternum with incomplete postcoxal line (fig. 99). Functional wing present. Male genitalia symmetrical. Type-species: *Neotina cariba*, new species.

The only specimen of this genus thus far known is a male from Cuba. *Neotina* is the only representative of the Sticholotidini known to occur in the West Indies as the other 3 genera are South American. The smooth, broad head, obliquely slanted apical segment of the maxillary palpus, and prosternum with the median protuberance distinguish *Neotina* from these other genera. The most closely allied Old World genus is *Sticholotis*.

The generic name is an arbitrary combination of letters, and the gender is feminine.

Neotina cariba Gordon, **new species**

Holotype.—Male, length 1.60 mm, greatest width 1.40 mm. Form round, convex (fig. 82). Head piceous with greenish tint; pronotum piceous with purplish tint; elytron reddish orange except humeral callus, lateral margin, and apical third dark with purplish tint; ventral surface piceous except mouthparts, antenna, and tarsi brownish yellow. Head shiny, extremely finely alutaceous, finely punctured, punctures nearly invisible, separated by 2 to 5 times a diameter. Pronotum with surface as on head except punctures coarser, separated by 1 to 2 times a diameter. Elytron smooth, polished, punctation dual, large and fine punctures sparsely intermixed; lateral border flanged, abrupt, with fringe of short, widely spaced hairs. Meso- and metasterna shiny, smooth, finely punctured. Abdomen with incomplete postcoxal lines extending to hind margin of first sternum, then outward parallel to suture (fig. 99). Genitalia with basal lobe slender, slightly longer than paramere; trabes short, stout (fig. 100); sipho strongly curved (fig. 101).

Type-material.—Holotype, Cuba, Baracaoa, 1918, WMMann (USNM 73767).

Remarks.—The specific name is a Neolatin noun indicating the Caribbean origin of this species.

Glomerella Gordon, **new genus**

Sticholotidini with form extremely convex (figs. 83, 84); wingless. Head with eyes small, separated by 3-5 times the width of an eye; clypeus projecting somewhat anteriorly; antenna inserted under lateral margin of clypeus anterior to eye, scape 7-segmented, club 3-segmented (fig. 105); mandible with 3 apical teeth (fig. 106); apical segment of maxillary palpus broad, not narrowed anteriorly, cardo with segmented palp-like appendage (fig. 104). Scutellum reduced. Elytron convex, thickened and extremely hardened, epipleuron broad, descending externally, foveate for reception of femur, right elytron fitted with "tongue" on sutural margin, left elytron with groove for reception of tongue; sparsely pubescent. Prosternum lobed anteriorly, coxae widely separated, intercoxal process with 2 median carinae. Meso- and metasterna with depressions for reception of legs. Legs with all femora swollen and grooved for reception of tibiae (figs. 108-110), front tibia grooved and expanded for reception of tarsus; tarsus cryptotetramerous. Abdomen with 5 visible sterna, first sternum with depressions for reception of leg, postcoxal line incomplete (fig. 107). Male genitalia symmetrical. Female genitalia with accessory gland and infundibulum present (fig. 111). Type-species: *Glomerella perconvexa*, new species.

This genus contains the most highly modified species of Coccinellidae known to me. They are completely wingless and have the elytra fitted with a tongue-and-groove locking apparatus. The entire body, including the internal muscle attachments, is hard, rigid and extremely heavily sclerotized. The appendages are retracted into cavities on the ventral surface and the dorsum is smooth, polished and highly convex. These modifications make the specimens difficult for a predator to grasp, hold, or ingest. Very likely the appendages are folded and the beetle drops like a pellet when disturbed.

The affinities of this genus are difficult to determine and do not seem to be with any of the New World genera. The form of the maxillary palpus and the expansion of the clypeus onto the eye are like those of *Lotis* and related genera, but there seem to be no other similarities. The mandibles and structure of the ventral surface resemble those of the South African genus *Pharopsis* Casey, and I consider *Pharopsis* to be the most closely allied of the extant genera. However, the similarities between the 2 genera are too tenuous to be of much significance.

The generic name is a Latin noun referring to the convex, rounded form, gender is feminine.

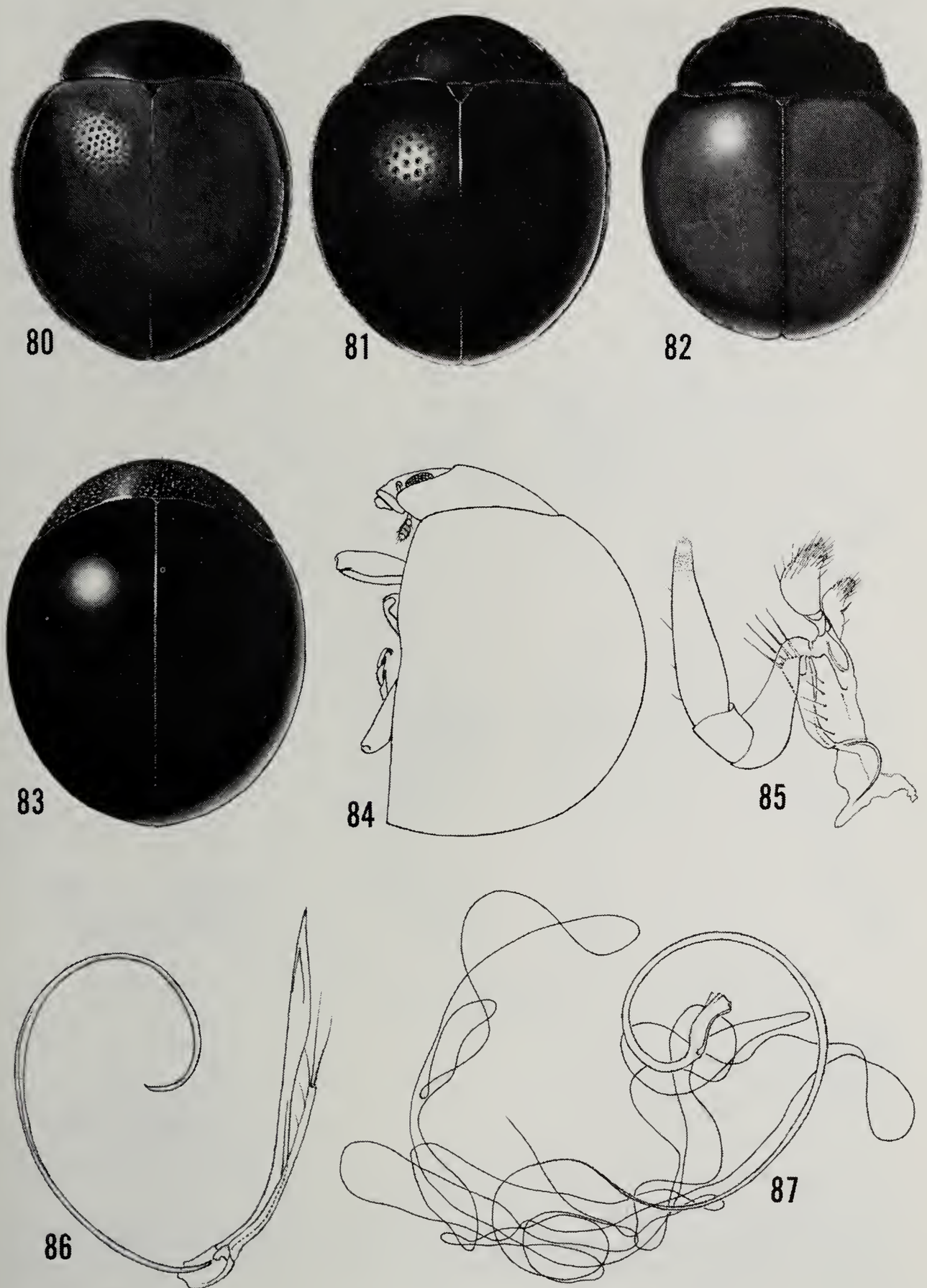
Key to species of *Glomerella*

1. Clypeus with anterolateral angle produced (fig. 102); Brazil ..... *G. perconvexa*, n. sp.
1′. Clypeus with anterolateral angle not produced (fig. 103); Colombia ..... *G. gnoma*, n. sp.

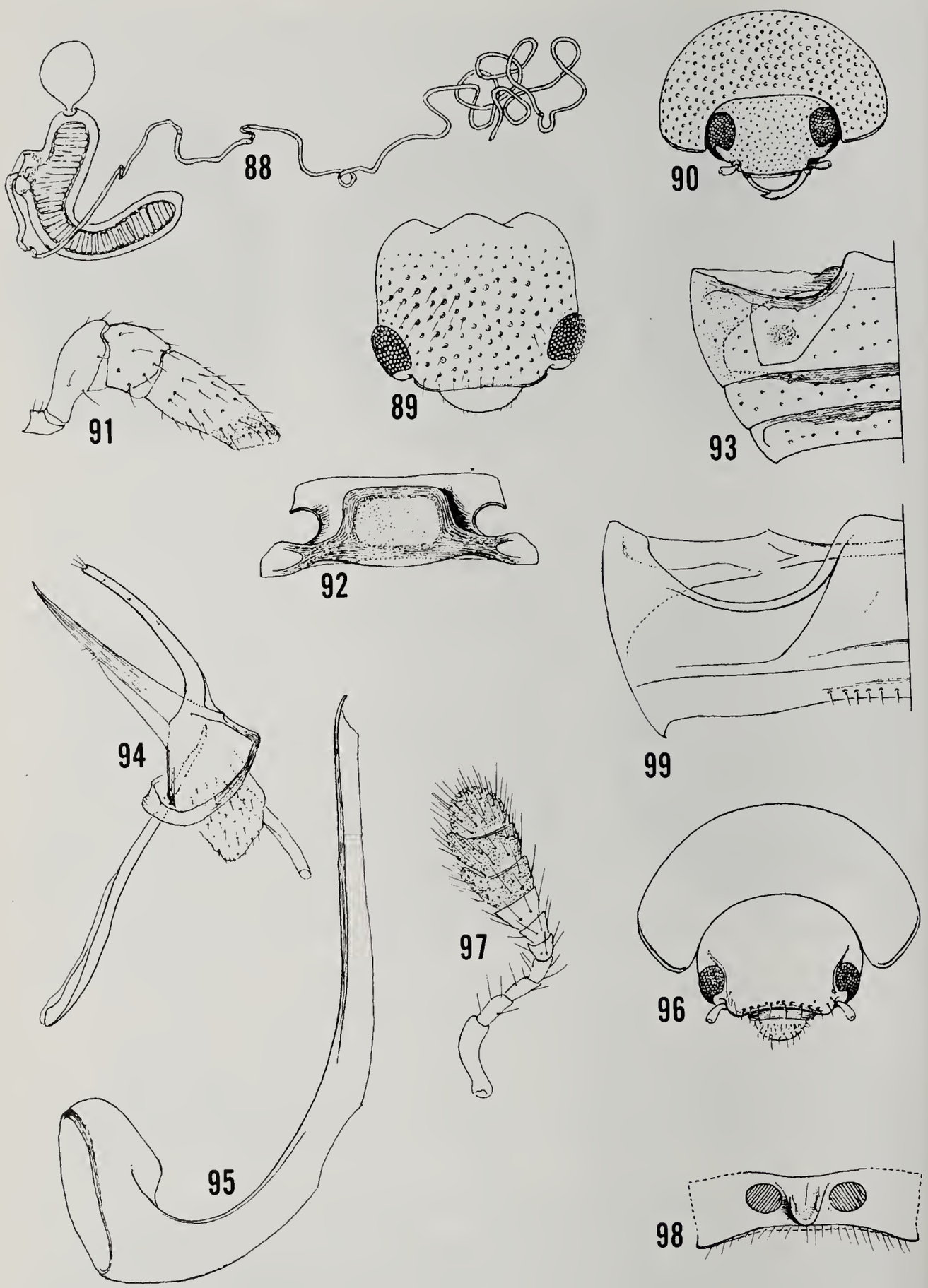
Glomerella perconvexa Gordon, **new species**

Holotype.—Female, length 1.50, greatest width 1.30 mm. Form round, extremely convex, forming half an oval in lateral view (fig. 84). Color piceous, nearly black; pronotum and most of head dark reddish piceous; clypeus, legs, epipleura, mouthparts, and antennae reddish brown; venter dark reddish brown except apical abdominal sterna paler reddish brown. Head with anterior clypeal border weakly emarginate medially, clypeal angle produced, rounded (fig. 102); surface feebly shiny, strongly reticulate, coarsely punctured, punctures separated by less than to twice a diameter, very short, sparse pubescence present. Pronotum feebly shiny, strongly reticulate, coarsely and densely punctured, punctures separated by a diameter or less, very short sparse pubescence present. Elytron smooth, polished, punctures extremely fine, nearly invisible, widely separated, some extremely fine, sparse pubescence

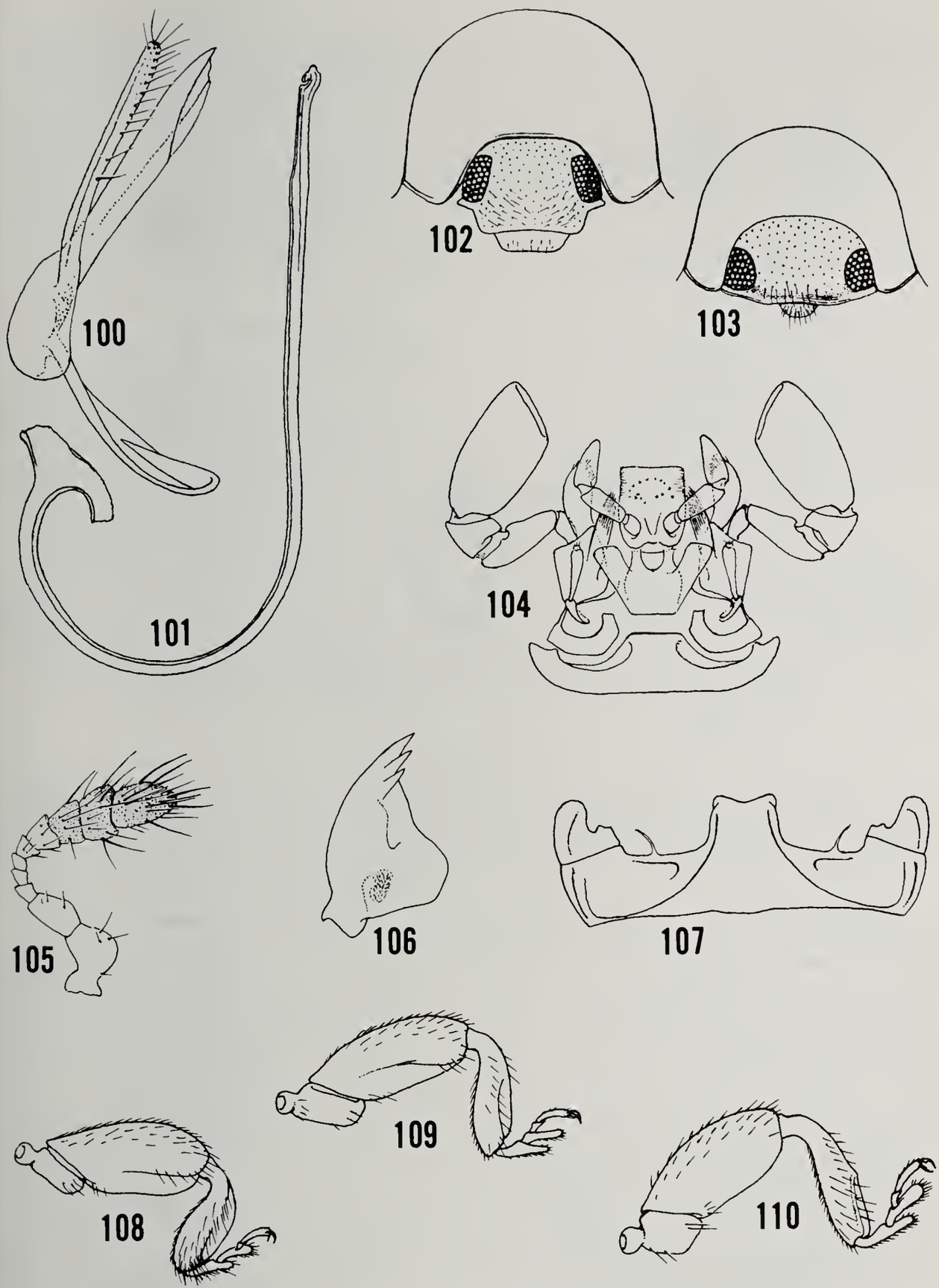
present. First abdominal sternum with postcoxal line incomplete, abruptly bent upward at apex (fig. 107). Genitalia with spermathecal capsule strongly curved, accessory gland present, infundibulum long, slender (fig. 111).



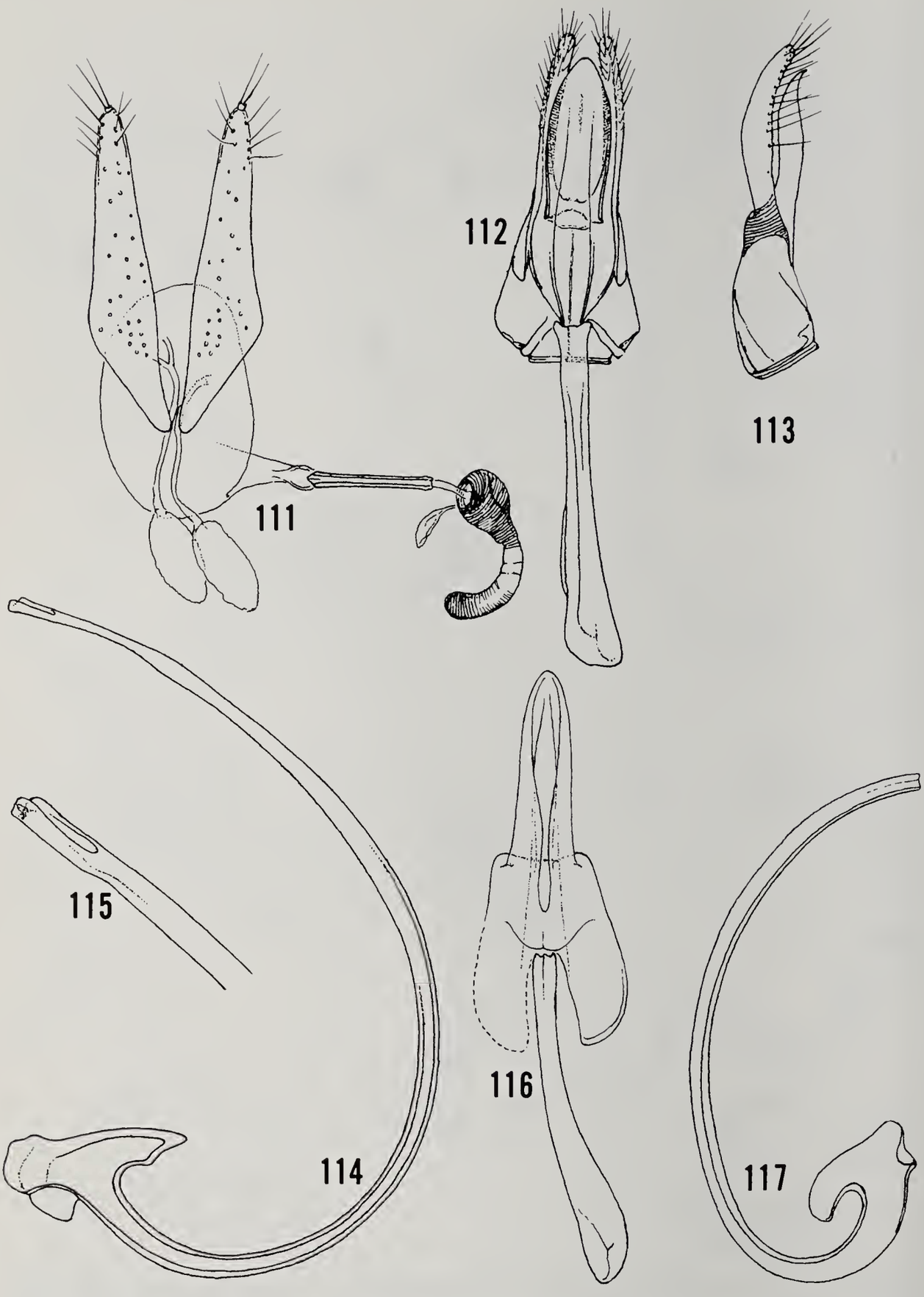
Figs. 80-87. Figs. 80-83, habitus views: 80, *Nexophallus lindemanni*; 81, *Nesina amazonia*; 82, *Neotina cariba*; 83, *Glomerella perconvexa*. Figs. 84-87: 84, lateral view, *Glomerella perconvexa*; 85, maxilla, *Nexophallus semiglobus*; 86, 87, male genitalia, *Nexophallus lindemanni*.



Figs. 88-99. Fig. 88, spermatheca and sperm duct, *Nexophallus lindemanni*; 89, head, *Nexophallus lindemanni*. Figs. 90-95, *Nesina amazonia*: 90, head; 91, apical segment of maxillary palpus; 92, prosternum; 93, abdomen; 94, 95, male genitalia. Figs. 96-99, *Neotina cariba*: 96, head; 97, antenna; 98, prosternum; 99, abdomen.



Figs. 100-110. Figs. 100, 101, male genitalia, *Neotina cariba*. Fig. 102, head, *Glomerella perconvexa*. Fig. 103, head, *Glomerella gnoma*. Figs. 104-110, *Glomerella perconvexa*: 104, mouthparts; 105, antenna; 106, mandible; 107, first abdominal sternum; 108, anterior leg; 109, middle leg, 110, hind leg.



Figs. 111-117. Figs. 111-115, *Glomerella perconvexa*: 111, female genitalia; 112-115, male genitalia. Figs. 116, 117, *Glomerella gnoma*, male genitalia (parameres broken),

Allotype.—Male, similar to female in all respects except sexual characters. Phallobase shorter than trabes, basal lobe sinuate in lateral view, shorter than paramere (figs. 112, 113); sipho as in figs. 114, 115.

Type-material.—Holotype, Brazil, Rio de Janeiro, Campo Grande, July 31, 1957. P. A. Berry collector (USNM 73784). Allotype, Brazil, Sao Paulo, Campinas, F. C. Camargo. Paratypes, 18: 3, same data as holotype; 6, Brazil, Rio de Janeiro, IV-14-39, P. A. Berry, on bamboo scales; 3, Brazil, Rio de Janeiro, II-7-39, K. A. Bartlett, on citrus scales; 2, ex. Brazil, intercepted at Puerto Rico, 27-1-1968; 4, "Brass.", Sammlung Cl. Müller (USNM) (ZSBS).

Remarks.—The specific name is a Latin adjective meaning extremely convex.

Glomerella gnoma Gordon, **new species**

Holotype.—Male, length 1.16 mm, greatest width 0.82 mm. Descriptions as for *perconvexa* except form more extremely convex dorsally, slightly flattened laterally; anterior margin of clypeus nearly truncate, anterolateral angle not produced (fig. 103); punctures on elytron distinctly visible, separated by 1 to 2 times a diameter, lateral border with margin thickened, sinuate medially. Genitalia with basal lobe slender, slightly curved (fig. 116); parameres lost; sipho as in fig. 117 (apex lost).

Type-material.—Holotype, Colombia, Magdalena, Rió Frio, Darlington (MCZ).

Remarks.—This species is known only from the holotype. It is clearly congeneric with *perconvexa* but quite distinct in having the strongly gibbous form, anterolateral angle of clypeus not produced, thickened lateral border of the elytron, and distinctly visible elytral punctures.

The specific name is a Neolatin noun referring to the small size.

Phylogeny

The methods I use for reconstructing a phylogeny are essentially those of Hennig (1966). No further discussion should be necessary because many recent authors have applied these methods and have explained the use of them to the point of redundancy.

There is what I consider an unfortunate tendency on the part of many modern systematists and associated members of the scientific community to dismiss out of hand the importance of any taxonomic work that does not have a phylogenetic discussion per se. This attitude has led to a proliferation of such discussions in situations where they are unnecessary because origins and relationships are patently clear or because the available data are not sufficient to allow significant phylogenies to be reconstructed. If one wishes to indulge in such mental gymnastics, then it should be sufficient that he do so, but he should not necessarily expect it of others. There are certainly many problems in systematics where a phylogenetic exercise serves as a valuable tool to aid in the resolution thereof. If the problem at hand lends itself to phylogenetic interpretation, then such an interpretation should be included. Important contributions to evolutionary theory and the probable past history of organisms involved can be derived through use of phylogenies, but the simple presence or absence of such a section in a taxonomic paper should have no bearing on the scientific merit of that paper.

In spite of, or perhaps because of, the preceding statements, I present a discussion of the phylogeny of the New World Sticholotidinae. I believe that, in this case, it is of some value.

Sasaji (1968) considered the Sticholotidinae the most primitive subfamily of Coccinellidae, with the ancestral character states of the common ancestor of living Sticholotidinae to include the following: narrow junc-

tion between the mentum and submentum; broad and compact articulation of the meso- and metasterna; metendosternite with broadly separated anterior tendons; flat ninth sternum of the male; larvae wth very short antennae; pointed apex of maxillary palpus; flat apical setae of tibiotarsi; and body wall without waxlike exudation or setose spines. Additional probable ancestral character states are listed in table 1.

Suspected phylogenetic relationships are summarized in fig. 118, and derived character states used to support these relationships are indicated by numbers in table 1. In the figures derived character states are indicated by black dots, and in multi-state characters the most derived state is indicated by a prime.

TABLE 1. Characters and character states used in phyletic analysis of Sticholotidinae.

Character	Character State	
	Ancestral	Derived
(1) Anterior portion of head	projecting	not projecting
(2) Basal segment of maxillary palpus	minute	large
(3) Apical segment of maxillary palpus	slender, always strongly narrowed	broad, conical or slightly narrowed
(4) Basal segment of labial palpus	inserted terminally	not inserted terminally
(5) Pronotum	with anterolateral line	without anterolateral line
(6) Prosternum	not concealing mouthparts	concealing mouthparts
(7) Prosternum	with anterior lobe	without anterior lobe
(8) Intercoxal process of prosternum	slender	broad, T-shaped
(9) Tibiae	not angulate	externally angulate
(10) Number of abdominal sterna	six	five
(11) Dorsal surface	strongly pubescent	glabrous or with insignificant pubescence

TABLE 2. Characters and character states used in phyletic analysis of *Scotoscymnus*.

Character	Character State	
	Ancestral	Derived
(1) Antenna	scape 7-segmented club 2-segmented	scape 9-segmented club with 1 segment
(2) Humeral callus	present	absent
(3) Elytral ridge	present	absent
(4) Wings	present	absent
(5) First abdominal sternum	with 2 pits	with 1 pit without pit (')
(6) Tarsi	with 4 obvious segments	with third segment reduced

Ancestral Sticholotidinae differentiated into 2 stocks, the tribe Sukunahikonini on one hand and Microweisini, Serangiini, and Sticholotidini on the other. The first major dichotomy is based on the intercoxal process of the prosternum which is T-shaped and broad in the derived condition, slender, not T-shaped in the ancestral condition. The supporting character of strong dorsal pubescence (ancestral) or lack of pubescence (derived) is of less value because the presence of some pubescence has either been retained or has evolved independently in some members of the other lineages.

The derived condition of the abdomen having 5 visible sterna was developed by the sticholotine-serangiine lineage and is not repeated elsewhere in the phylogeny. Other derived characters supporting this dichotomy are the lack of an anterior pronotal line and the lack of an anterior prosternal lobe.

The derived character states of the Serangiini are the completely concealed mouthparts and externally angulate tibiae. The projecting head, type of antennal club, and form of the maxillary palpus are ancestral states shared with the Microweisini and Sukunahikonini. This reconstructed phylogeny points out the strong differences between modern representatives of the Sticholotidini and the Sukunahikonini. Zoogeographic data suggest an ancient split which almost certainly took place prior to the separation of South America and Africa at the close of the Cretaceous (65 million years ago).

The reconstructed phylogeny of species taxa of *Scotoscymnus* is shown in fig. 119, and the principal data used are listed in table 2. The first dichotomy in the phylogeny relects the differentiation of *S. pygmaeus* from the remainder of the genus. The presence of a distinct third tarsal segment is a strong ancestral character and I have also considered the presence of abdominal pits to be an ancestral character state. However, I have no solid reason to so consider the latter state except that lack of pits is a reduction and the most ancestral of the remaining lineages in the genus (*stephensi* lineage) has species with abdominal pits present.

TABLE 3. Characters and character states of the tribe Microweisini.

Character	Character State	
	Ancestral	Derived
(1) Head	not concealed beneath pronotum	concealed, partially or entirely
(2) Head	extremely elongate	not extremely elongate
(3) Eyes	small	large
(4) Eyes	coarsely faceted	finely faceted
(5) Maxillary palpus (apical seg.)	slender, elongate	broad, short
(6) Antenna	scape, 7-segmented club 3-segmented	scape 6-segmented, club 3-segmented; scape 7-segmented, club 2-segmented
(7) Prosternum	strongly lobed	weakly lobed
(8) Elytra	pubescent	glabrous
(9) Tarsus	cryptotetramerous	trimerous

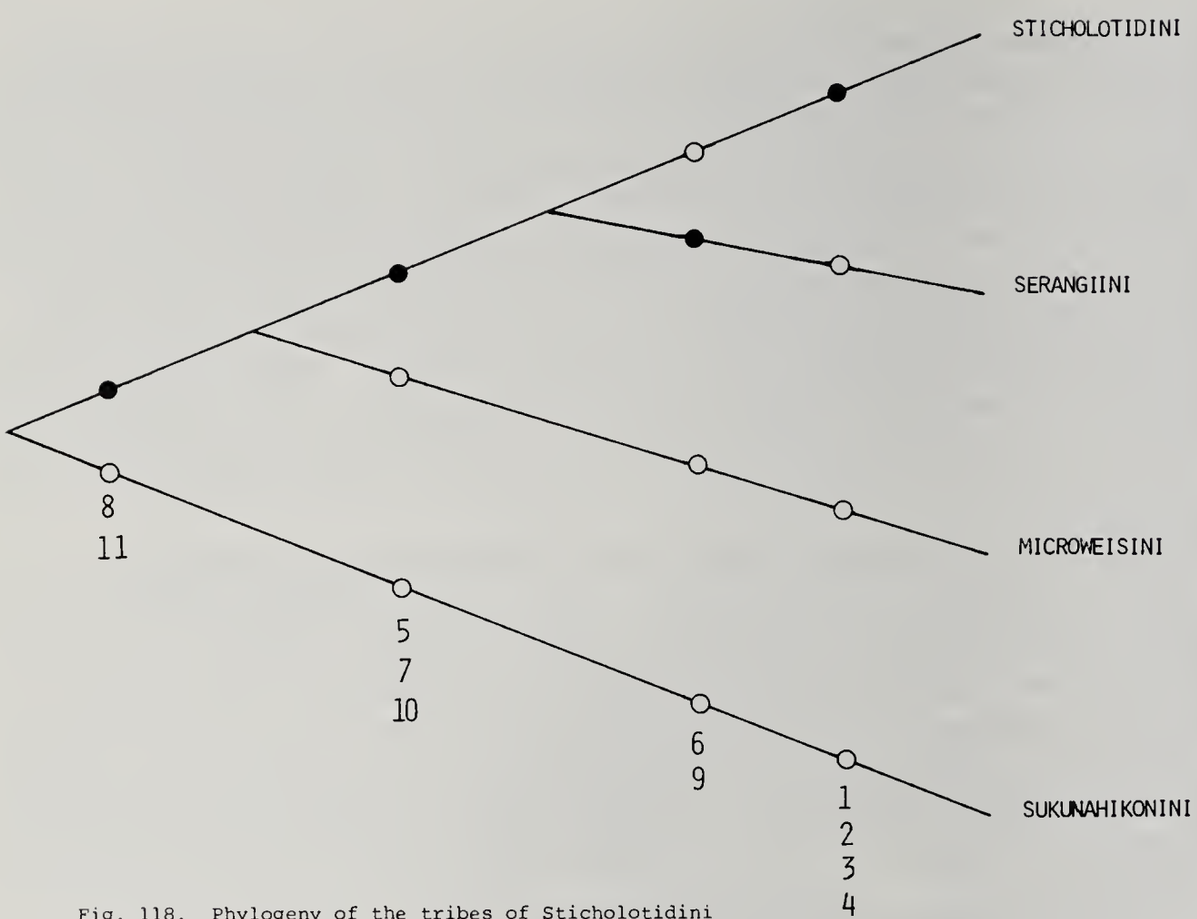


Fig. 118. Phylogeny of the tribes of Sticholotidini

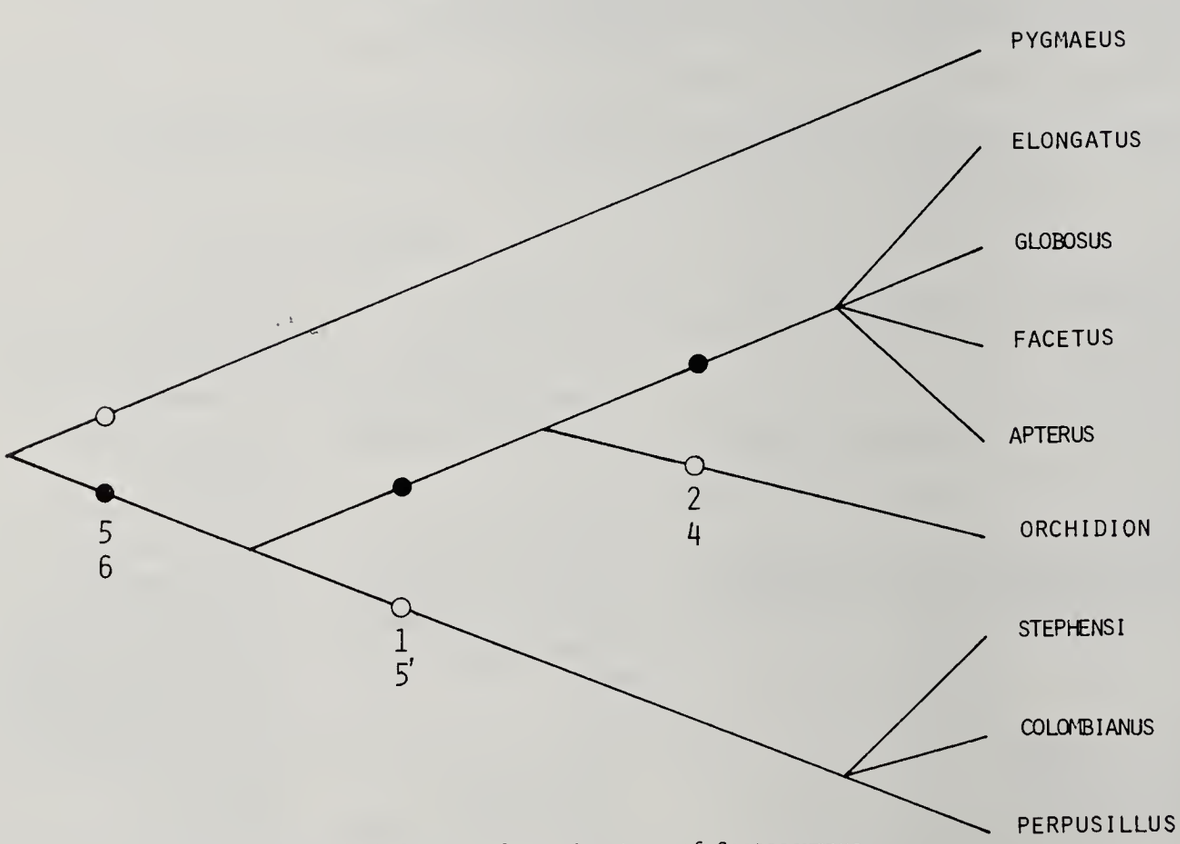


Fig. 119. Reconstructed phylogeny of species taxa of Scotoscymnus.

The derived character states of 9-segmented antennae and lack of abdominal pits characterize the *elongatus* lineage and split it from the *stephensi* lineage. These derived character states are shared by *S. orchidion*, but *S. orchidion* is split from the *elongatus* lineage because it possesses the ancestral winged condition. The *elongatus* lineage (4 species) and *stephensi* lineage (3 species) are not further defined in the phylogeny because of a lack of significant characters.

I have not prepared a phylogenetic scheme for the Microweisini because significant groupings are not possible with the characters available for use. Table 3 lists the available characters and character states, and fig. 120 is a character state matrix for this tribe. *Microcapillata* is the only lineage that clearly splits from the rest, possessing the following ancestral character states: head extremely elongate; eyes small; eyes coarsely faceted; elytra pubescent; tarsi cryptotetramerous. *Sarapidus* has the ancestral character states of cryptotetramerous tarsi, head not concealed beneath pronotum, and 10-segmented antennae, but the state of each of the other characters is derived. I consider *Microcapillata* and *Sarapidus* the most primitive genera in the tribe. The remainder of the genera are very similar in characters and character states. *Stictospilus* has the ancestral states of long dorsal pubescence and a pronounced prosternal lobe so I consider it somewhat primitive. *Coccidophilus, Microweisea,* and *Pseudosmilia* form a group because nearly all of the characters are derived with *Microweisea* retaining the ancestral 10-segmented antennae. I do not place *Gnathoweisea* with this latter group because it has the ancestral state of small, widely separated eyes and the derived state of partially concealed head. The character states of *Nipus* are almost equally divided between ancestral and derived. The strongly lobed prosternum and 10-segmented antennae I consider ancestral and the completely concealed head derived.

	1	2	3	4	5	6	7	8
1	o	o	o	o	o	o	•	•
2	o	•	•	•	•	•	o	o
3	o	•	•	•	•	•	o	•
4	o	•	•	•	•	•	•	•
5	o	•	o	o	o	o	o	o
6	o	o	•	o	•	•	•	o
7	•	•	o	•	•	•	•	o
8	•	•	o	•	•	•	•	•
9	o	o	•	•	•	•	•	•

Fig. 120. Character state matrix for the tribe Microweisini. Numbers on the side refer to the characters as listed in Table 3. Numbers across the top refer to the genera in the order in which they appear in the text.

The Sticholotidini are represented by only 4 genera in the New World and any attempt at reconstructing a phylogeny without using the numerous Old World genera would not be significant. The following comments apply only to the New World fauna. I consider *Nexophallus* as probably the most primitive genus because the slender, tapered apical segment of the maxillary palpus, widely separated eyes and flat prosternum are ancestral character states. Derived character states include complete postcoxal lines and complex male genitalia. *Nesina* is similar to *Nexophallus* in most respects but possesses the additional derived states of a short, expanded apical segment of the maxillary palpus, a raised rectangular area on the prosternum, and narrowly separated eyes. Character states in *Neotina* are derived except for the incomplete postcoxal lines and widely separated eyes which are ancestral. *Glomerella* possesses characters that I would normally consider ancestral but here are apparently derived as adaptations to the mode of existence. These are the presence of cavities on the ventral suface for the legs and presence of a small anterior lobe on the prosternum. In addition, the derived character states include the broad apical segment of the maxillary palpus; shiny, convex dorsal surface; and reduced scutellum. The widely separated, coarsely faceted eyes represent an ancestral character state. I consider *Glomerella* the most advanced of the New World genera of Sticholotidinae.

Zoogeography

The subfamily Sticholotidinae is best developed and most diverse in the Old World. How many lineages exist in the Old World is open to question, but based on genera I have examined, probably not more than 6 or 7. Four of these lineages, or more than half, are represented in the Western Hemisphere. The modern distribution pattern indicates that the ancestral stock of this subfamily was ancient, and indeed it probably was the base of the family Coccinellidae. The modern species form more or less isolated groups (genera), many of them monobasic and often possessing quite different facies; this is the typical pattern of a primitive lineage having extant survivors.

The genus *Scotoscymnus* is the only Western Hemisphere representative of the Sukunahikonini and is known from Mexico to Colombia. I find it difficult to explain the modern distribution of this genus because it is apparently pantropical; species are known from the Belgian Congo, Java, Mauritius, and Micronesia as well as the Western Hemisphere (fig. 121). Of the 19 known species, 8 occur on the Micronesian islands and 9 in the Western Hemisphere. Each species is quite distinct, but I find it impossible to place them in more than one genus. How then can the present distribution be accounted for? This apparently widely disjunct distribution may be an artifact of collecting, but even if this is so, an explanation is still difficult. *Scotoscymnus* is very probably the most ancient of the extant genera of Coccinellidae, and the present distribution of the species is the result of continental drift. The ancestral stock of this lineage was probably spread throughout what is now Africa and South America prior to the Lower Cretaceous. After fragmentation of the continents massive extinction must have occurred in both hemispheres through the Miocene and Pliocene. Modern remnants exist as indicated in figure 121, limited to northwestern South America, Central America, and Mexico in the Western Hemisphere. The

most primitive of the extant genera of the Sukunahikonini (*Orculus* Sicard) is known from coastal West Africa (Sierra Leone and Principe Island) which may indicate that this is the area of origin of the ancestral stock, but this is a matter of pure speculation. The presence of a number of species on the Micronesian islands indicates that these beetles are capable of rapid dispersal and speciation on island chains. Gressitt (1954) gives the age of the older Micronesian islands as Miocene or before but states that most of the islands are less than 10 million years old which would make them of Pliocene or Pleistocene age. Truk and Ponape are said to have been formed in the Eocene and Oligocene (25-40 million years ago). It is of interest that the majority of the described Micronesian species are found on these older islands. The Micronesian fauna may be the result of invasion from the mainland of southeast Asia, or it may be the result of transportation by early man. Plants infested with the host scales and predators could have been transported across the Pacific islands. If so, I would expect that other Pacific islands have members of this genus inhabiting them. In view of the facts that no New World species of *Scotoscymnus* have been described prior to this paper and that the Micronesian species were not described prior to 1965, I believe the distribution of this genus is far from completely defined. The salient facts that emerge so far are that the genus is pantropical and is primarily associated with the Pacific Ocean, its islands, and the corresponding areas of Central America and Colombia.

The tribe Microweisini differs from the other 3 tribes discussed herein in that it is primarily New World in distribution with 2 monotypic genera in the Old World. Two of the 3 primitive genera of New World Microweisini (*Sarapidus* and *Stictospilus*) are apparently strictly Chilean and this would indicate the presence of the ancestral stock in southern South America. I judge that the ancestral stock of this lineage was present in Gondwanaland

Fig. 121. The known distribution of members of the genus *Scotoscymnus*.

before fragmentation began 125 million years ago in the Lower Cretaceous (Raven and Axelrod 1975). The modern distribution in the Western Hemisphere is the result of radiation during the ensuing eras. The presence of a single modern genus (*Dichaina*) in Australia leads me to believe that extinction probably occurred in Australia during the Tertiary when that continent changed its latitude (Main, 1976) and in so doing became mostly a desert continent. In South America climatic conditions changed during the Late Miocene and Pliocene, particularly in the south, became increasingly dry and cold (Solbrig 1976). This led to isolation, extinction, and migration of ancestral Microweisini. According to Savage (1974) the final link between South America and Central America was established in the Early Pliocene. From that time on free overland interchange of organisms has been possible. I presume the ancestral stock of the modern genera of Microweisini presently occurring north of the Isthmus migrated north from South America during the Pliocene and early Pleistocene. Radiation occurred during and since the Pleistocene, resulting in the present array of genera and species.

The genus *Delphastus* represents the tribe Serangiini in the New World. This is a tropical genus with only 2 species extending into the north and south temperate regions. The ancestral stock from which the modern genera of Serangiini arose probably originated in what is now eastern Asia or Australia, based on the present distribution of genera. There seem to be 2 possible explanations for the presence of *Delphastus* in the New World. One is that the ancestral lineage entered North America via the Bering Land Bridge in the early Tertiary when warm temperate or tropical conditions prevailed. Movement to the south and east must have occurred with some extinction in the northern regions as climatic changes transpired during and after the Oligocene. The fact that *Delphastus* is presently found in tropical and warm temperate regions would seem to substantiate this theory. Savage (1974) indicated that direct land connection between Central and South America took place in the Pliocene and migration into South America would have taken place in late Pliocene and Pleistocene. The other possible explanation involves plate tectonics. Geologic evidence indicates that South America was directly connected with Africa and, via Antarctica, with Madagascar, India, and Australia (Raven and Axelrod 1975) during the Middle Cretaceous. Separation began in the Lower Cretaceous but opportunities for migration across islands between South America and Australia existed until Early Oligocene. Because almost exactly parallel situations presently exist in regard to the number and distribution of species in the Northern and Southern Hemispheres, it is difficult to indicate which of the 2 possibilities discussed is the most probable. Australia presently has a sizeable fauna of Serangiini (genus *Serangium*) and what evidence is available tends to point toward the southern route of migration. As in North America, changing climatic factors have prevented the occurrence of extant species or genera in southern South America. Information on the zoogeography of the Aleyrodidae would be helpful in analyzing the present distribution of the Serangiini, but this is not available.

The tribe Sticholotidini has many modern genera and species in the Old World but is known from only 4 genera and 7 species in the Western Hemisphere. The affinities of the genera *Nexophallus* and *Nesina* are with the Old World *Sticholotis* and *Lotis*. *Sticholotis* occurs from Japan and

Formosa to Australia and there are more than 50 described species in the genus. *Lotis* and related genera are all African with fewer than 20 described species. The present distribution pattern indicates that the New World genera are remnants descended from an ancestral stock left behind when South America and Africa separated during the Cretaceous. The depauperate fauna presently existing in the New World would seem to indicate that extensive radiation did not take place or that a great deal of extinction has taken place. The presence of a single modern genus in Cuba tends to lend credence to the latter alternative. This genus is probably descended from ancestral stock that reached Cuba from South America prior to the Pliocene with no extant survivors remaining on any nearby land mass.

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